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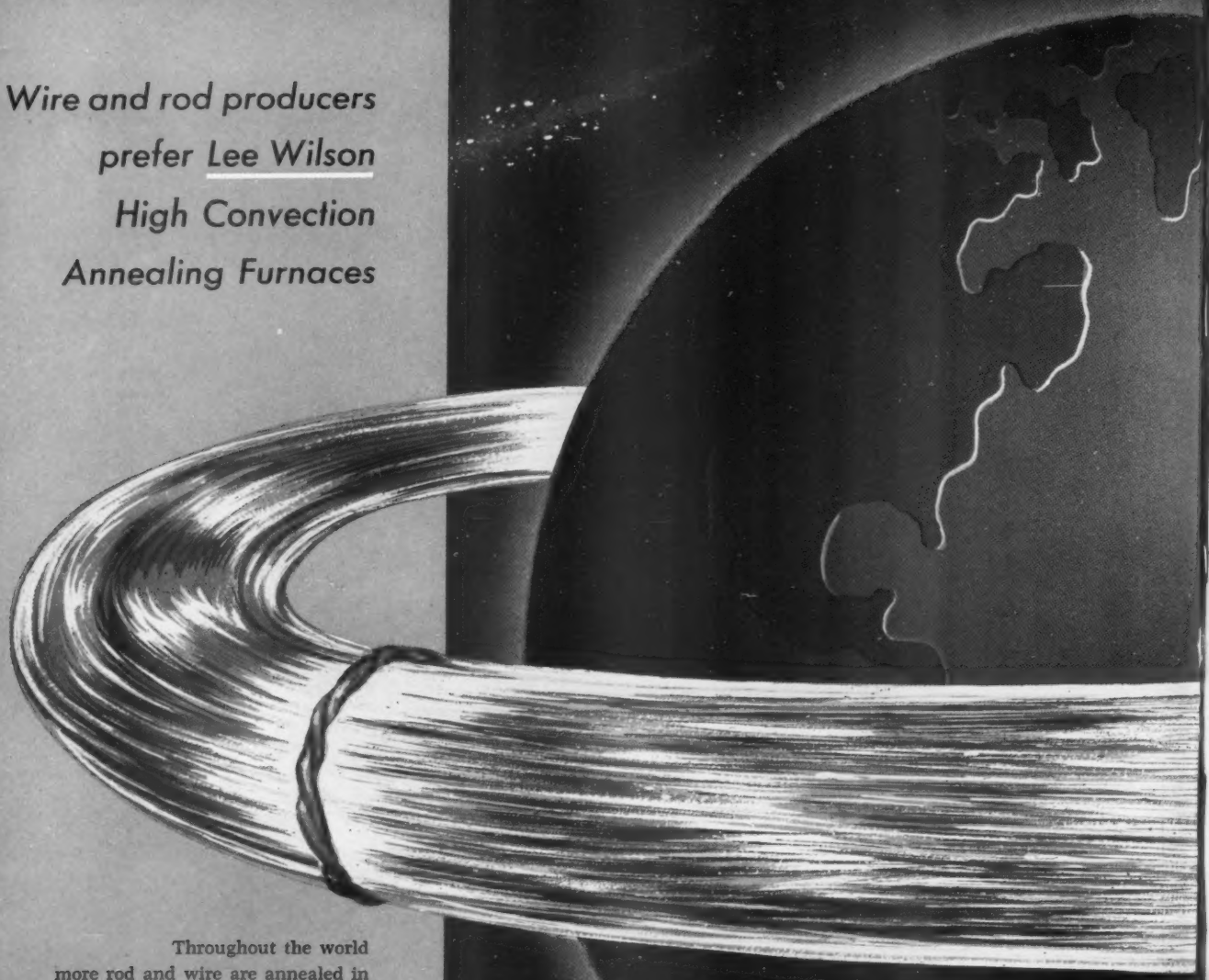
All around the World..

Wire and rod producers prefer Lee Wilson High Convection Annealing Furnaces



Throughout the world more rod and wire are annealed in Lee Wilson Furnaces than in all other makes combined.

Only Lee Wilson has the quick-heating "O" tube that brings the charge to temperature faster, more uniformly. The Lee Wilson design permits greater concentration of heat around the entire charge and tremendous velocities of hot gas movement within the furnace. And a specially designed diffuser assembly assures circulation down through the spiders to heat the coils from inside as well as outside.

If wire or rod processing is part of your business, be sure you have the finest annealing equipment. Join the leaders the world over and use Lee Wilson Furnaces.

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HIGH CONVECTION ANNEALING FURNACES

MAKE THE BEST METALS BETTER

*ORIGINATORS AND LEADING PRODUCERS OF HIGH CONVECTION ANNEALING FURNACES

TO "KEEP YOUR SHOW ON THE ROAD" Use

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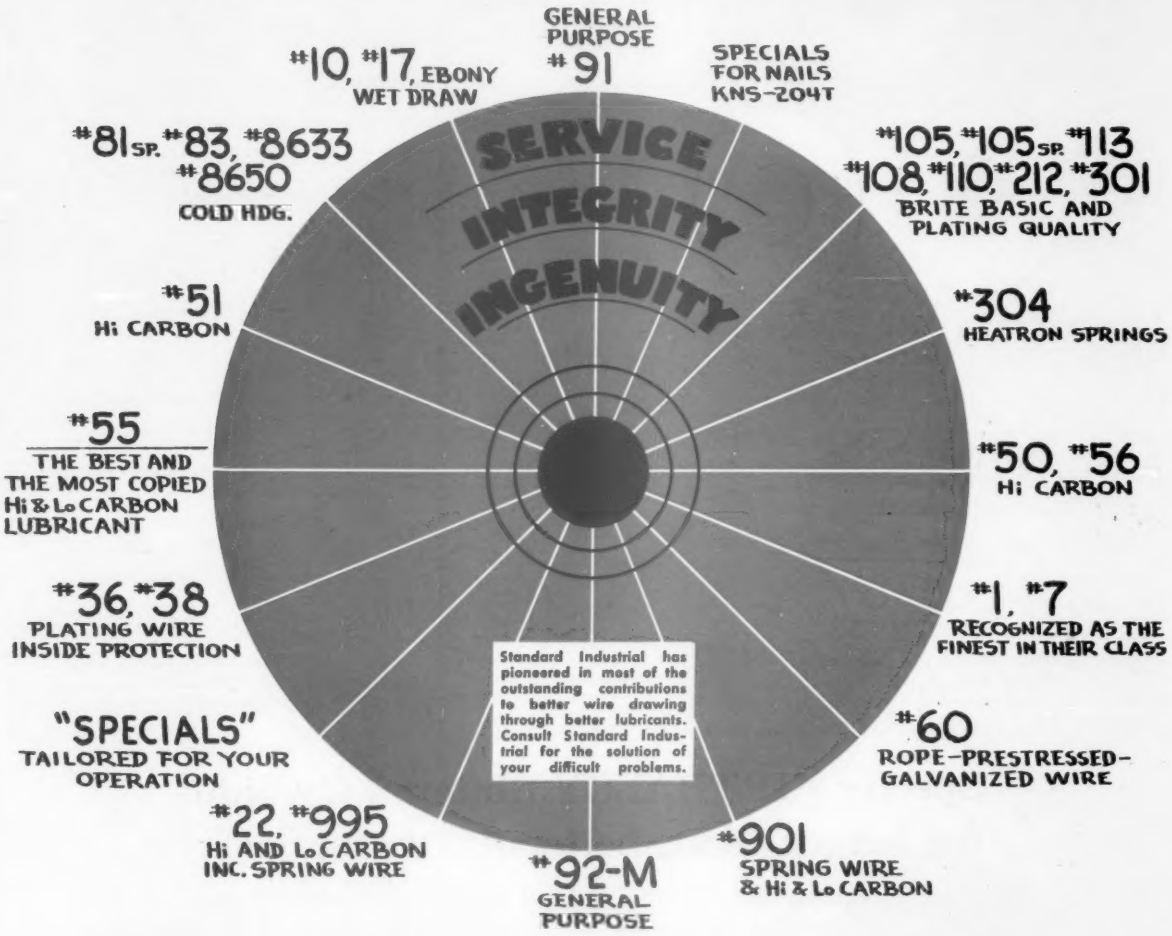
We of Standard have concentrated our efforts, since our inception, toward the development of lubricants to solve your drawing problems!



These are our Prime Business, Not a sideline.

Respectfully yours,

Standard Industrial

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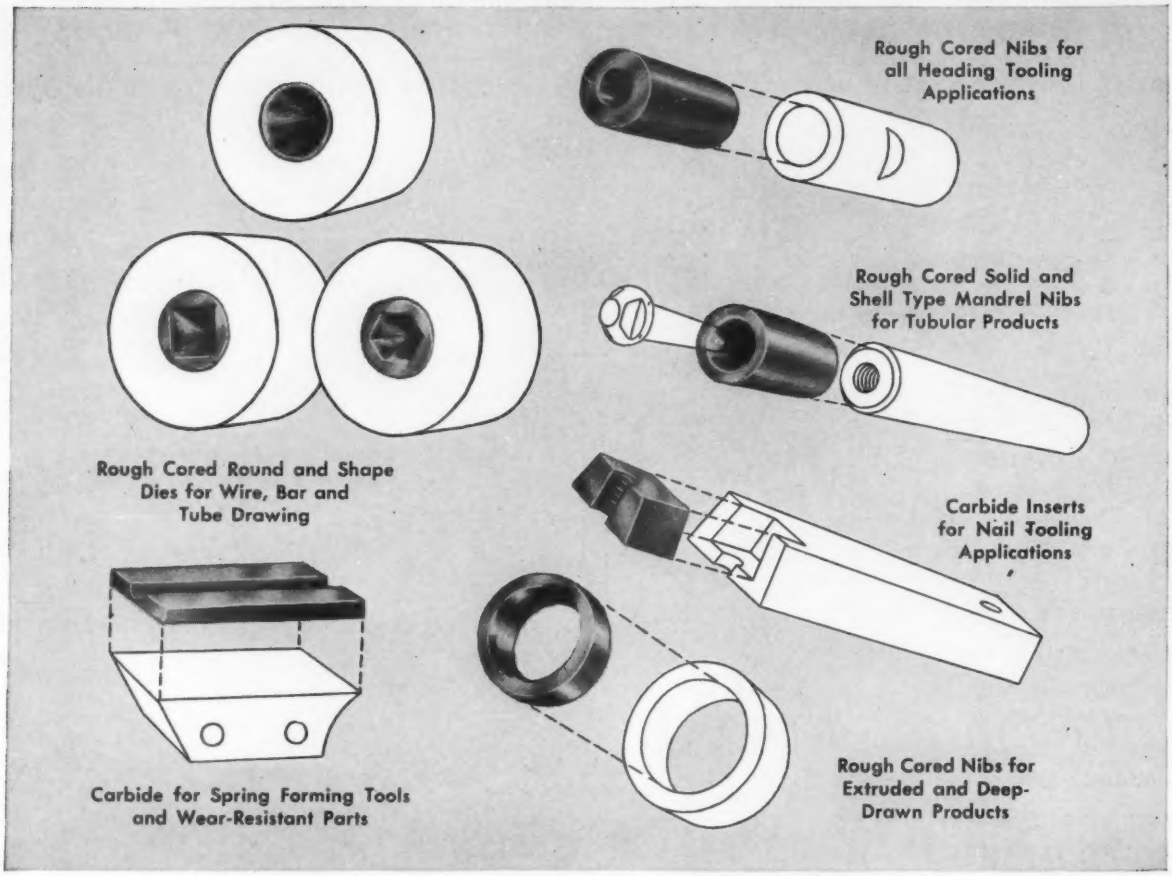
Firth Sterling ...

PIONEER IN POWDER AND MOLTEN METALLURGY


Rough Cored Nibs for all Heading Tooling Applications
Rough Cored Solid and Shell Type Mandrel Nibs for Tubular Products
Rough Cored Round and Shape Dies for Wire, Bar and Tube Drawing
Carbide Inserts for Nail Tooling Applications
Carbide for Spring Forming Tools and Wear-Resistant Parts
Rough Cored Nibs for Extruded and Deep-Drawn Products

Specify FIRTHALOY Sintered Carbide for longer wear, better finish, low cost

Standard of quality for 28 years for drawing and forming operations, Firthaloy Sintered Carbide assures maximum performance and increased production.

Leading tool and die makers have adopted Firth Sterling as a preferred source for standard wire, tube and bar dies in a complete range of sizes—as well as a variety of other shapes.

And for close cooperation between your tool and die maker and experienced Firth Sterling engineers—extra "teamwork" that pays off in results—specify FIRTHALOY.

Firth Sterling, Inc., Dept. 17F, 3113 Forbes St., Pittsburgh 30, Pa. Offices and warehouses in principal cities.

PRODUCTS OF *Firth Sterling* METALLURGY

HIGH SPEED STEELS • TOOL & DIE STEELS • STAINLESS SPECIALTIES • HIGH TEMPERATURE ALLOYS
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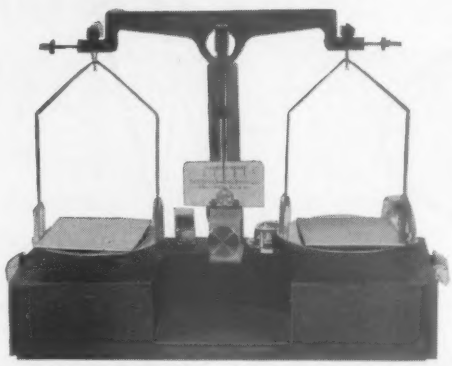
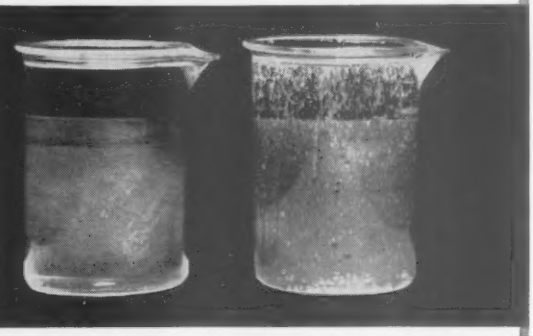
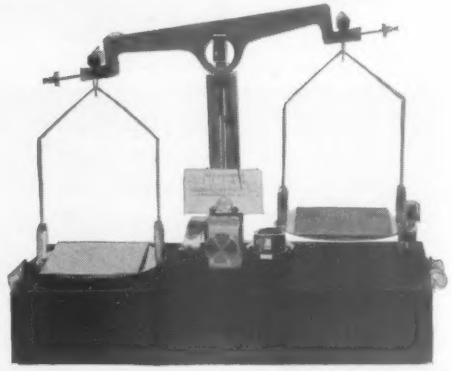
FIRTH STERLING TRADE MARK



NO WEIGHT DIFFERENCE. Two identical panels of low-carbon sheet steel were used. They balanced the scale.



RODINE MINIMIZES ACID ATTACK. Each panel was placed in a beaker containing 10% by volume of 66° Bé sulfuric acid at 160°F. The acid in the right-hand beaker was uninhibited. The acid in the left-hand beaker was inhibited with Rodine 82, ¼% by volume of the concentrated acid. There was little or no hydrogen evolution in this beaker . . . Rodine retarded the attack of the acid on the base metal.



RODINE SAVES METAL. Both panels were removed from the acid pickle solutions after 5 minutes. The one pickled in the uninhibited acid had lost 1.4% of its original weight. The one pickled in the Rodine-inhibited acid had lost only 0.001%. This represents a saving of 26 lb. of steel for each ton pickled; and a simultaneous saving of nearly 50 lb. of 66° Bé sulfuric acid when Rodine is used to inhibit the acid.

ACP Rodine®

SAVES ACID, SAVES METAL— GIVES YOU MORE STEEL TO SELL

With ACP Rodine as the pickling acid inhibitor, you use less acid and have more steel to sell. Up to 50 lb. of acid is saved per ton of steel pickled and up to 26 lb. of steel. Fuming is practically eliminated. Formation of blisters and embrittlement is minimized. Costs of charging and cleaning of pickle baths are reduced—baths can be operated longer, and less acid is required to keep them at desired concentration. There are fewer rejects—steel pickled in acid inhibited with Rodine has uniformly clean, bright surfaces, free of pits, blisters and smut.

LEARN MORE ABOUT ACP RODINE. Bulletin 1381 tells the complete story. Write for your copy today.

AMERICAN CHEMICAL PAINT COMPANY, Ambler 30, Pa.

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New Chemical Horizons for Industry and Agriculture

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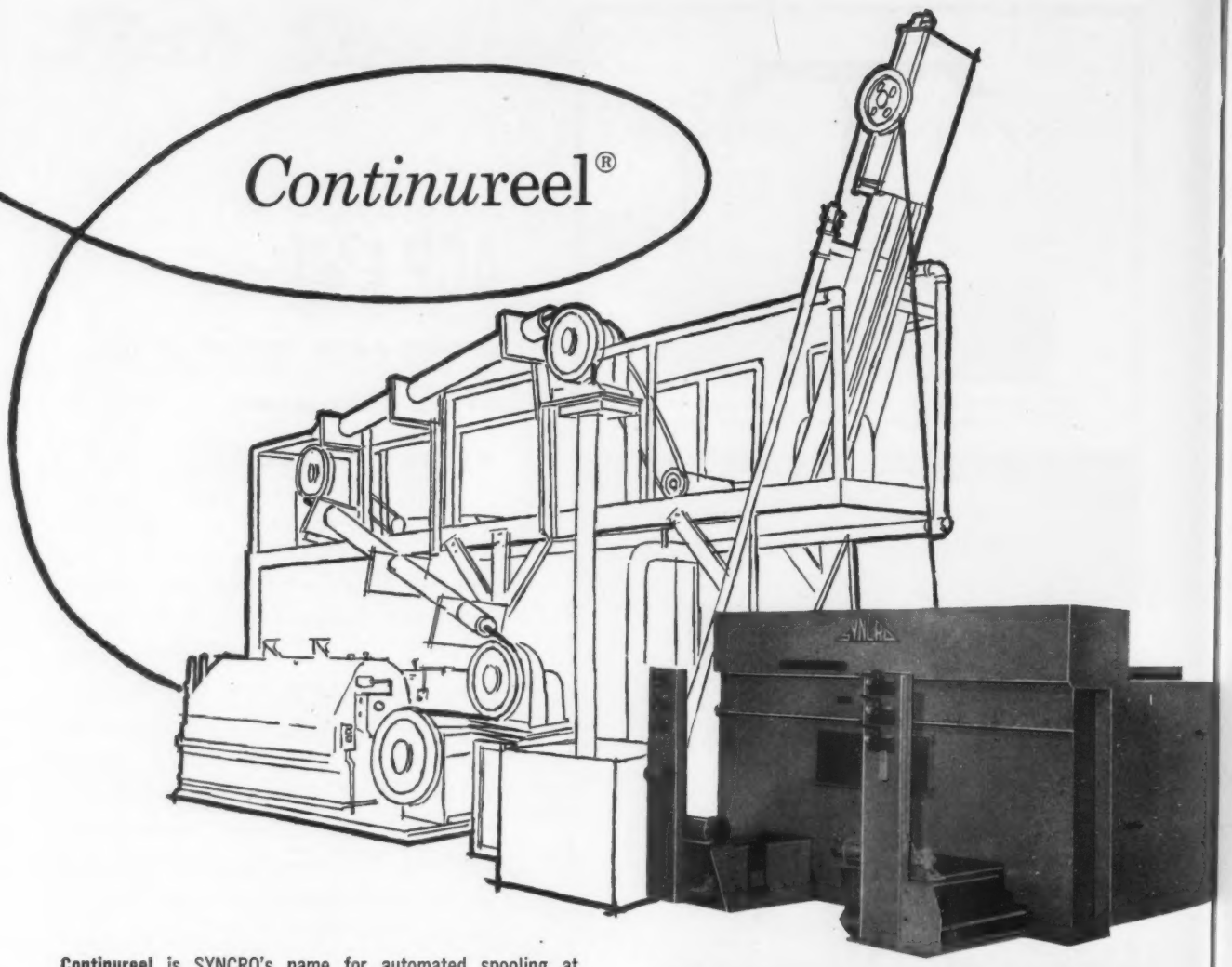
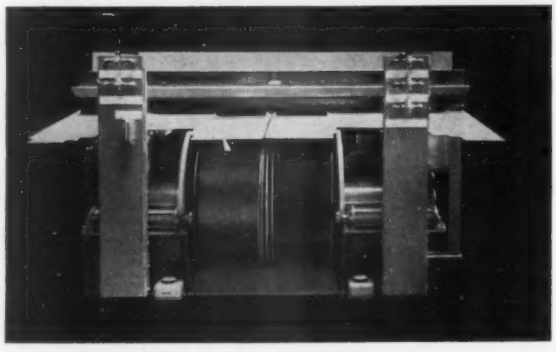


Continureel is SYNCRO's name for automated spooling at speeds up to 4000 F.P.M. for copper and 5000 F.P.M. for E.C. aluminum, without shutdowns.

Shown here, the **Continureel** is operating as part of SYNCRO's exclusive automated method of copper wire drawing, annealing and spooling in one continuous operation. **Continureel** may, however, be adaptable to your present machinery in your mill. Its superiority of performance in speedy spooling of wire up to #6 soft, and #8 hard copper is unmatched. Accommodates standard reels to 30″ in diameter.

Unquestionably, this is today's most practical spooling method — based upon the best cost-cutting features of automation.



Look first to SYNCRO today!

Continureel means

- No spool change-over shutdowns
- Successive starting shock loads eliminated
- Maximum speed and spool capacity
- Easier, Faster, Safer!

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WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 33 June, 1958 No. 6

Designated as Official Publication By The Wire Association

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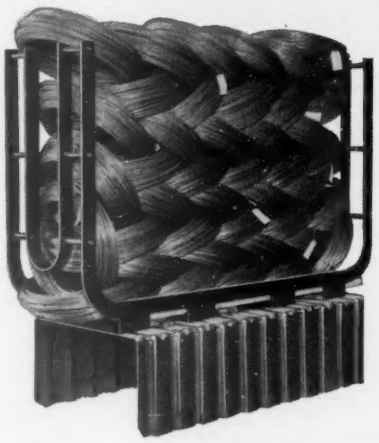
NEW IDEA

IN WIRE HANDLING

- **Saves Floor Space**
- **Reduces Costs**
- **Frees Cluttered Aisles**



Republic's new Stack 'N Store Units provide a practical and economical solution to the problem of wire handling.

The units are especially adaptable to bulk material, such as coiled wire, that does not require the use of completely enclosed sides. Specially designed "U" shaped superstructure permits high stacking of coiled wire.

Fully loaded superstructures are handled quickly and easily by crane. Or superstructures may be placed on skids and the entire unit readily moved to a storage area by lift truck.

Republic Stack 'N Store Units save valuable floor space, eliminate cluttered aisles, reduce handling time and costs.

Mail coupon for more information.

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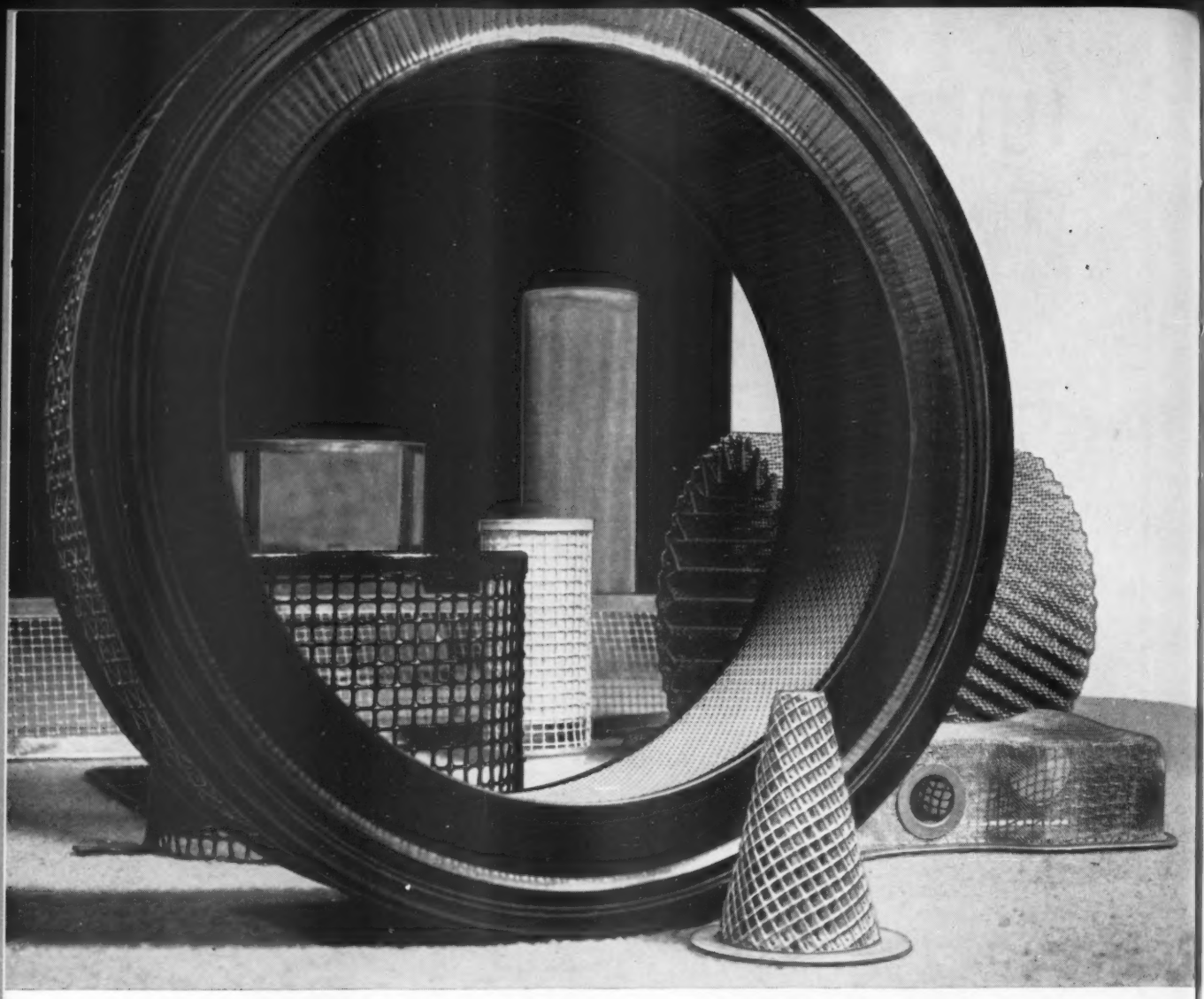

How to **USE** wire cloth at lower cost

Today many companies are able to make wire cloth components, like these shown here, at lower cost than ever. The answer lies in new services, new developments worked out by the *Reynolds Wire Division* of National-Standard . . . ideas aimed at the more effective, less wasteful *use* of industrial wire cloth. For example . . .

5 SUGGESTIONS:

1. Check on wire cloth rolls 2 to 8 times normal length . . . for 2 to 8 times as much production in a single run. Fewer shutdowns. Less handling.

2. Consider pre-slit widths, plain or with woven-in reinforcement, as narrow as 1 inch or less, to meet your requirements exactly with minimum handling and waste.

3. Evaluate Reynolds' new palletized packaging. Less chance of damage. Faster, easier handling on arrival, in and out of storage and right to production operations.

4. Look into the many different weaves, meshes, metals, finishes and coatings . . . some unique with Reynolds . . . to make sure of the optimum specification for your requirement.

5. By all means take advantage of Reynolds' engineering and analytical service . . . nation-wide and unmatched in the industry. Time and time again it contributes to a better finished product at lower cost.

NATIONAL NS NATIONAL-STANDARD Company **STANDARD**

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Long experience in wire insulation makes **Trulon 500** a proven and tested product. **Trulon 500** has all the properties you look for in PVC resins.

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We are manufacturers of an extensive line of Trulon PVC resins and Truflex plasticizers. Complete specifications and technical service available at your request. Write today.

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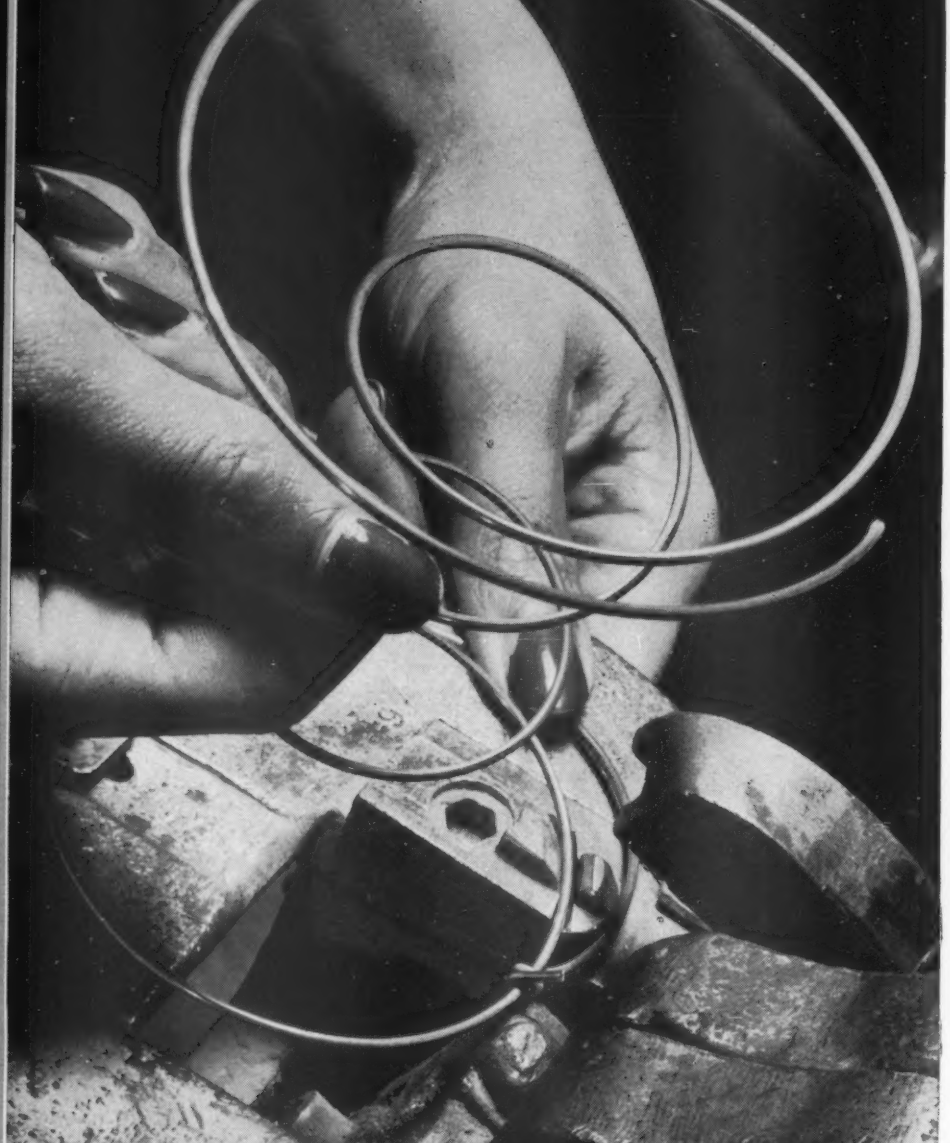

Tough test for Pittsburgh Steel's upholstery wire at Piedmont Spring Co. comes in coiling and knotting spring. Wire that is too hard will break; wire too soft will lose springiness even after tempering. Uniform quality of Pittsburgh Steel wire insures uninterrupted production.

Pittsburgh Steel wire adds years of life to upholstery springs

Piedmont Spring Company calls Pittsburgh Steel upholstery wire "Best we've ever seen"

Pity the poor upholstery spring . . .

It goes through the most torturous stresses and strains just getting made. Then, fully formed and ready for use, all it can look forward to are years and years of supporting tons of jumping, running, standing, sitting or just-lounging human weight.

If that upholstery spring is unappreciated, then consider how underrated its wire can be. You have to be a veteran upholstery springmaker to know what it takes to make a first rate spring that can outlast the furniture it serves.

Such men are Bill and Bob Gaston of Piedmont Spring Company, Hickory, N.C. They choose only superior quality wire—like that supplied by Pittsburgh Steel Company. During their 31 years of combined springmaking experience, the Gaston brothers have seen just about every twist and turn there is to springmaking. Bill Gaston, who handles purchasing, sums up Pittsburgh Steel upholstery grade wire this way:

"Pittsburgh Steel wire is the best we've seen anywhere. And I'd tell that to anyone. It's exactly what a manufacturer needs in this business. We get uniform quality in every shipment."

Combination of quality Pittsburgh Steel high carbon upholstery wire and precision springmaking gives Piedmont upholstery springs enough liveliness and durability to serve several generations of furniture owners.

Liveliness—a must in an upholstery spring—can be seen when the finished spring is compressed. If it springs back to within one-quarter of an inch of its original length, say nine inches in a frame spring, then it has the quality to take years of hard use.

Upholstery wire from Pittsburgh Steel also must be able to withstand severe deformation during coiling and knotting.

Proper grain structure is another must. Too hard—the wire will break, scrapping an entire coil. Too soft—the wire will coil and knot easily—but it will be lifeless even after tempering. Plant Superintendent Bob Gaston cites another all-important requirement:

"The wire we use must have uniform diameter—only .001 variation plus or minus allowed up to .075-inch and .002 variation for .076-inch and larger. If the wire didn't meet our close tolerances, it would seriously damage our coiling machines and stop production. And you know what that does to costs and lost orders. But there's no worry there with Pittsburgh Steel wire."

Piedmont Spring also uses Pittsburgh Steel's border and brace low carbon wire for edgewire frames that hold cushion springs. This wire must be able to withstand crimping and bending and have enough stiffness to support the finished unit. High carbon upholstery grade wire—.047 to .155-inch diameter—is transformed into cushion, back and frame springs. Lacing wire is used to join springs together in cushion and back frames.

Bill Gaston gives much of the credit for his company's enviable spring reputation and low production costs to wire from Pittsburgh Steel. He states flatly:

"We've never had a complaint from a customer because of the quality of the wire. It has never failed to meet our specs."

"And there's another thing I like about Pittsburgh Steel's performance," Bill adds. "That's the service. We keep a low inventory of wire. Many times we run to the bare minimum, but we always get our shipments on time to keep production going.

"When we want to talk to Pittsburgh Steel's district sales office, we get quick attention from the district manager himself right on down.

"Our aim at Piedmont is to make only the best upholstery springs—springs that will take years of hard use without failure. And we get them thanks to the most important ingredient in a spring—quality wire like ours from Pittsburgh Steel."

These same benefits from Pittsburgh Steel's upholstery grade wire can be yours, too. And they don't stop with upholstery wire. Oil tempered wire, bright basic, core wire, ACSR wire, rope wire, high carbon MB spring wire or any other kind of manufacturers' wire are available to serve your needs.

Trained Pittsburgh Steel engineers are close at hand to put their knowledge and experience to work in helping solve your problems.

Specify Pittsburgh Steel wire. Call the nearest district sales office listed at right. Do it today.

"Best wire we've ever seen" comments Bob and Bill Gaston (left and center) about high carbon upholstery grade wire from Pittsburgh Steel. The two owners of Piedmont Spring Co. check the life in a Piedmont upholstery spring after tempering. After compression, spring must return to within one-quarter of an inch of original length.

Cushion springs are joined together by lacing wire, forming the shape of a cushion frame for an upholstered chair. Piedmont springs made of Pittsburgh Steel wire take years of hard use.

Baling for shipping, Piedmont upholstery springs are compressed to save space. Bill Gaston says, "We've never had a complaint from a customer because of the quality of the wire."

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

District Sales Offices

Atlanta	Cleveland	Dayton	Los Angeles	Pittsburgh
Chicago	Dallas	Detroit	New York	Tulsa
		Houston	Philadelphia	Warren, Ohio

Our Engineering Answer to that

BIG HEAVY DUTY

LARGE REEL TAKEUP OR PAYOFF

is a new shaftless type, available in the following 3 models:

Weights	Max. Reel Sizes
10 Ton	84" to 108"
30 Ton	96" to 120"
50 Ton	96" to 186"

Here are a few of the features that bear emphasis for which we feel that there is no other unit available with comparable advantages. The Unit is available with a floor mounted traverse or mounted on separate carriage as a traversing reel takeup. The above illustration is the traversing reel takeup. The motorized side frames provide for reel adjustment over a wide range of reel sizes. The reel lift mechanism on this shaftless unit is fully motorized with heavy duty lead screw and solid bar guide and is provided with a limit switch for automatic disengagement of lift motor at both running and unload positions.

Driving of the machine is accomplished through heavy duty roller chain and spur gear arrangement remaining in full contact throughout lifting range for maximum efficiency and positive torque transmission. The traverse mechanism employs heavy duty electric clutches for immediate response on reversal and simple disengagement when required. A wide infinitely variable cable lay is effected without slippage through the use of a Cleveland-Speed-Variator. The reel pintles are mounted on heavy duty taper roller bearings designed for long life under heavy loads.

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Model G III
11 Drafts

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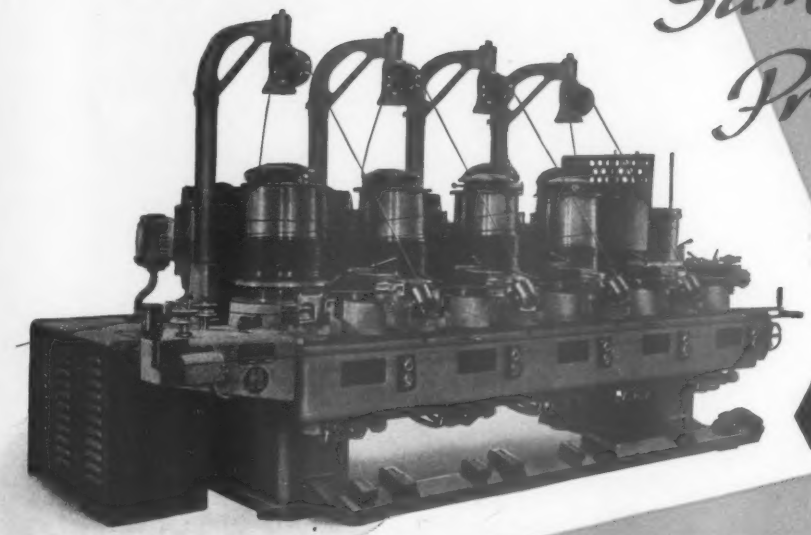

Model G III d
5 Blocks =
10 Drafts

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with MATERIAL HANDLING EQUIPMENT **LIFT-O-MATIC**

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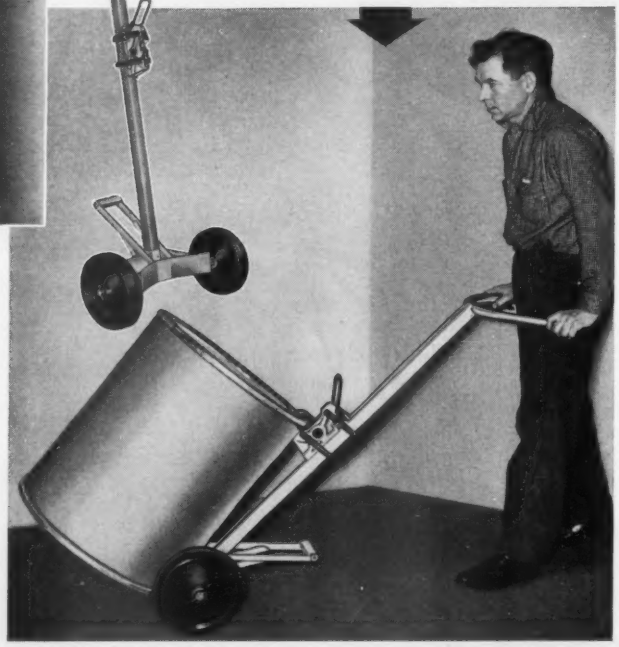
- EASILY
- ECONOMICALLY

MANUAL DRUM TRUCK

Automatic engagement and release. No prongs or studs to damage drum. Quickly adjustable for drums of any height. Exact placement without any manual handling. Light, (45 lbs.) all-steel welded construction. Steel disc wheels, with full roller bearings, equipped with solid demountable or molded-on rubber tires.



POWER TRUCK ATTACHMENT

One operator can attach or remove in only 2 minutes. Fits any truck, or can be interchangably used on different makes. Engages drum from top only, without damage to bead or rim. Handles all drums, singly or in multiples, regardless of size or kind, open or closed. Automatic, mechanical, maintenance-free operation, without additional operator control. No pallets needed for transporting or tiering.

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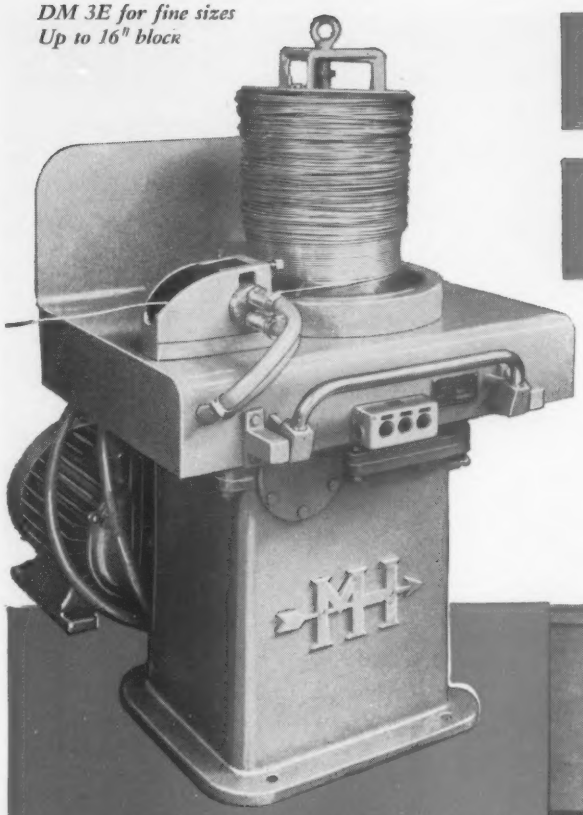
Up to 16" block



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DC drive for extended speed range

AC drive for two or more stepped speeds

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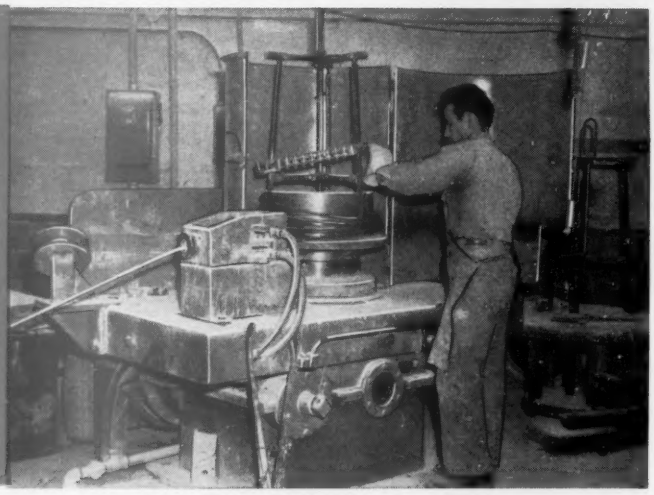
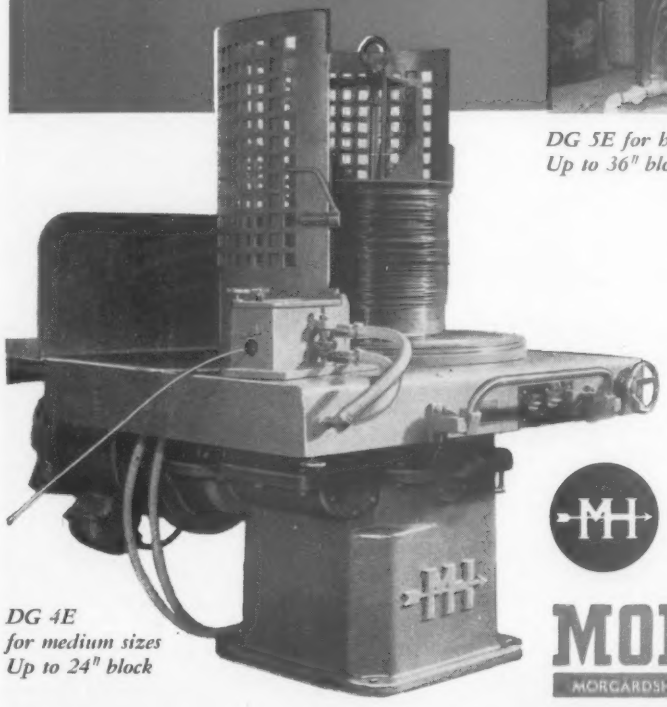


DG 5E for heavy sizes
Up to 36" block



DG 4E
for medium sizes
Up to 24" block

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Please contact us at:

19002 Lomond Boulevard

Cleveland 22, Ohio

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Here is recognizably superior Cold-Heading Wire that offers many important fabricating advantages . . . and assures equivalent superiority in finished cold-headed products.

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

For example, this high-copper-content wire is hot extruded from billets produced by Scovill's unique CONTINUOUS CASTING process. Hence, it is far more uniform in chemical composition and physical properties, and essentially free from metal defects.

Prove this on your next wire order. Let us help you specify the proper closely controlled Scovill temper to produce more nearly perfect headed brass parts . . . whether you require "flow" characteristics for heading, or "flow" plus essential rigidity for secondary machining.

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HIGH QUALITY

WET DRAWING UNITS

AT SUBSTANTIAL PRICE SAVINGS

Niehoff high-efficiency wet drawing units finish wire sizes from #15 to #30 at speeds up to 5000 fpm.

Spoolers are electromagnetically controlled.

Spool weights up to 450 pounds.

Transversal spooling by endless nylon tape with grip magnets.

Finishing-spool-release device produces extremely soft spools.

Stepless wire tension control by electromagnetic field.

FOR WIRE DRAWING MACHINES, IT PAYS TO THINK FIRST OF . . .

NIEHOFF

NIEHOFF MACHINE WORKS

SCHWABACH NEAR NURNBERG

WESTERN GERMANY

AMERICAN LAUBSCHER CORPORATION

TALIDE DIE SAVES OVER $20,000 DRAWING AUTO BUMPER GUARDS

● Oakman Manufacturing Company, large Detroit stamping firm, found it difficult to deep draw steel bumper guards. Complex bends, up to 120 degrees, produced extra stress and strain on the $1800 chrome-plated drawing die.

It was necessary to stone the die surface every hour, and hand polish entire drawing surface after each day's run. The steel die had to be completely reworked and a new chrome-plated surface added after drawing 60,000 parts. Downtime for maintenance made it difficult to maintain production schedules. Maintenance costs soared.

A Grade C-80 Talide die ($2700) was installed 8 months ago. To date it has drawn over 800,000 guards with no wear in evidence. Downtime for die maintenance has been greatly reduced. A buffing operation (25c per piece), previously required, has been entirely eliminated because of the smoother, brighter, more durable finish achieved with the Talide die.

A Talide die engineer can help you cut costs and increase production on draw presses, punch presses, pill presses, cold headers, swagers and draw benches. **METAL CARBIDES CORPORATION, 6001 SOUTHERN BLVD., YOUNGSTOWN 12, OHIO.**

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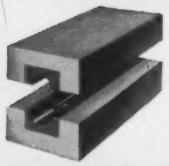
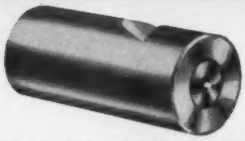
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



SWAGING DIES

Leading Fountain Pen Manufacturer cold swages 33 times more stainless steel parts with TALIDE dies.

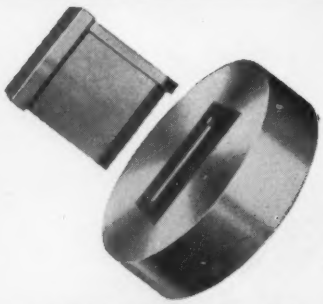


HEADING AND EXTRUSION DIES

Cold heading ¼" C-1008 rivets, TALIDE dies produced 11,200,000 pieces, other carbide dies only 3,500,000.

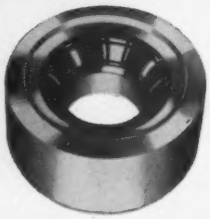
CURLING ROLLERS

TALIDE Curling Rolls last 65 times longer than steel rolls on beverage can forming operation.



BLANKING AND FORMING DIES

70 times more paper discs blanked out with TALIDE—over hard alloy die.

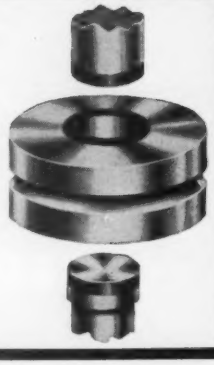


SHEET METAL DIES

137,000 hi-alloy steel pressure vessels drawn with TALIDE against only 7,900 with steel dies previously used.

POWDERED METALLURGY DIES

Compacting highly abrasive chemical powders, TALIDE pill dies last 4 months, steel dies wore out in 6 hours.

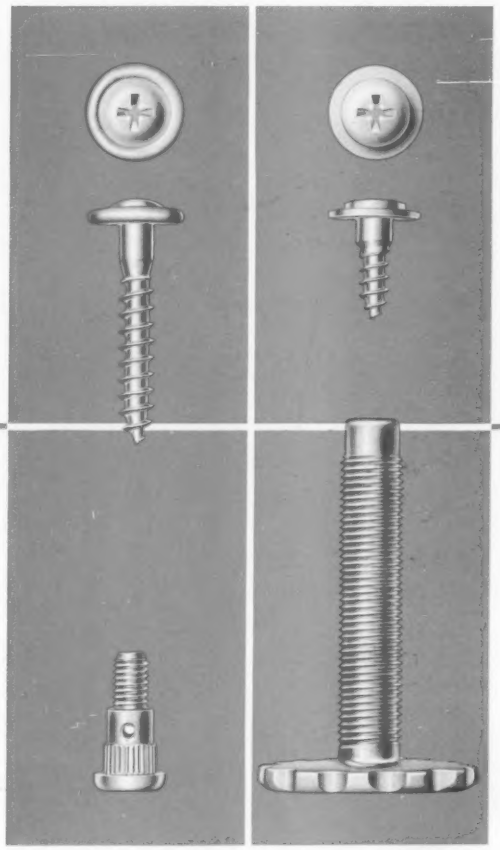


KEYSTONE XL WIRE STUDY

KEYSTONE XL WIRE solved heading problems for

NATIONAL LOCK COMPANY
ROCKFORD, ILLINOIS

ONE Replaces TWO . . . by cold heading this Phillips washer head screw, National Lock replaced an oval head screw and finishing washer at a substantial cost savings. Regular wire caused cracked heads and required 100% inspection, so National Lock turned to Keystone "XL" Wire and eliminated cracking.



DESIGN PROBLEM SOLVED . . . this was an unsatisfactory 2-piece assembly, and a 1-piece Phillips washer head shoulder screw appeared to be needed. However, the design seemed too severe for cold heading. National Lock made this part a production item with Keystone "XL" Wire . . . and at a savings.

QUALITY AND QUANTITY . . . National Lock found it possible to have both when using Keystone "XL" Wire to economically produce this knurled shoulder screw. This part required a wire which could withstand a very severe extrusion and still fill out a sharp knurl to keep the part from turning in application.

INCREASE DIAMETER . . . National Lock reports this 1-piece cold headed leveling screw serves the same purpose as a 2-piece welded assembly, and the scalloped head fits 12-point socket wrenches. The use of Keystone "XL" Wire permits an increase in head diameter and a great reduction of cracked heads.

flowability IS THE SECRET

Illustrated above are four ways National Lock Company, Rockford, Illinois, has profitably put Keystone "XL" Wire and its *flowability* in action. Your Keystone representative will be glad to assist you in finding a solution to your heading problems. See him soon or write direct.

Keystone Steel & Wire Company, Peoria 7, Illinois

KEYSTONE
WIRE FOR INDUSTRY

Keystone Steel & Wire Company
Peoria 7, Illinois

COLD HEADING FACTS FOLDER . . . send coupon today! New folder discusses uses, applications, methods, technical facts, wire requirements.

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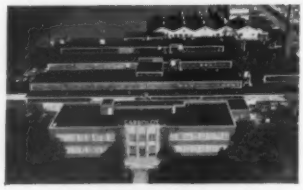

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— headquarters for the
Metallurgical Products Department

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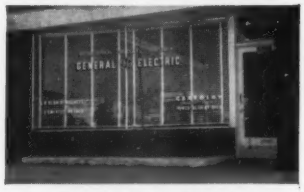
Pittsburgh, Pennsylvania



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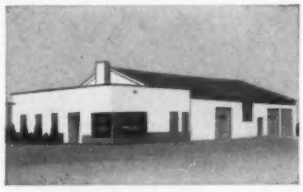

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EVG *"Europe's Most Experienced"*

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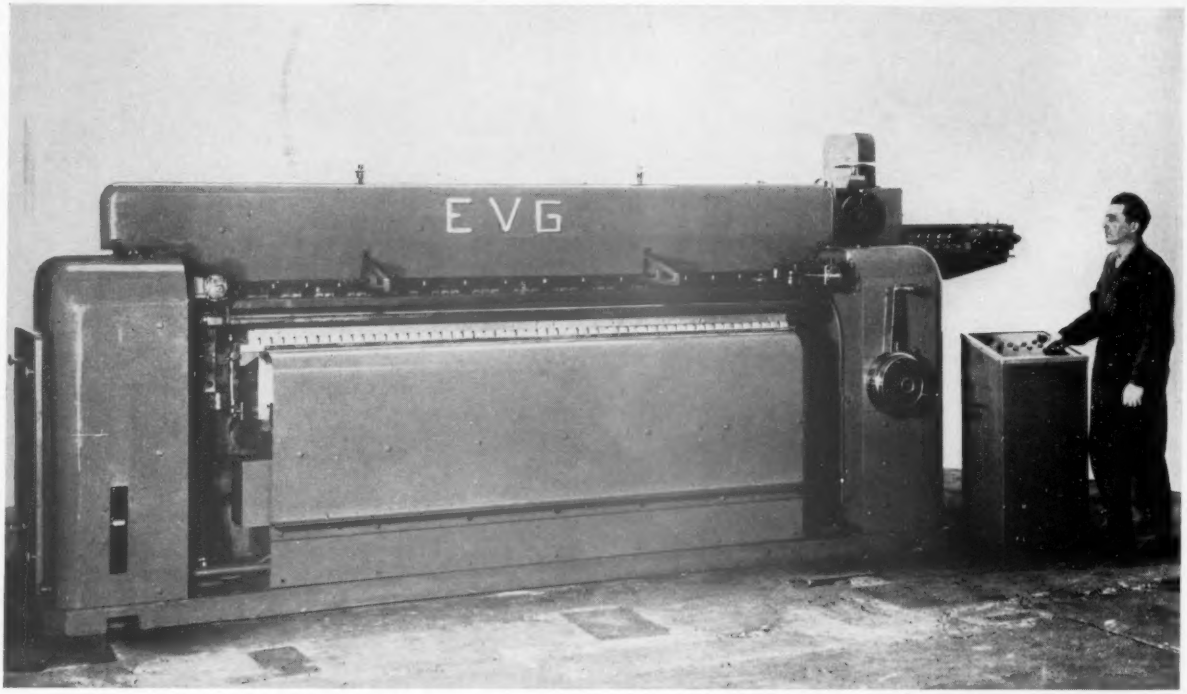

Shown in photograph: Model G5—gauge range 4/0 (other models up to 7/0)

Check these features of a typical EVG reinforcing mesh plant:

- WELDER UNIT:
  1. Latest type automatic feeding, straightening and cutting devices.
  2. Sensitive adjustments for pressure, heat and dwell.
  3. Full electronic controls.
  4. *Quick change-over* for spacing and gauge.
- CUT-OFF SHEAR:
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- SHEET HANDLING:
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- ROLL HANDLING:
  Fully automatic self-stripping roll take-up. Variable speeds permit continuous operation of welder.

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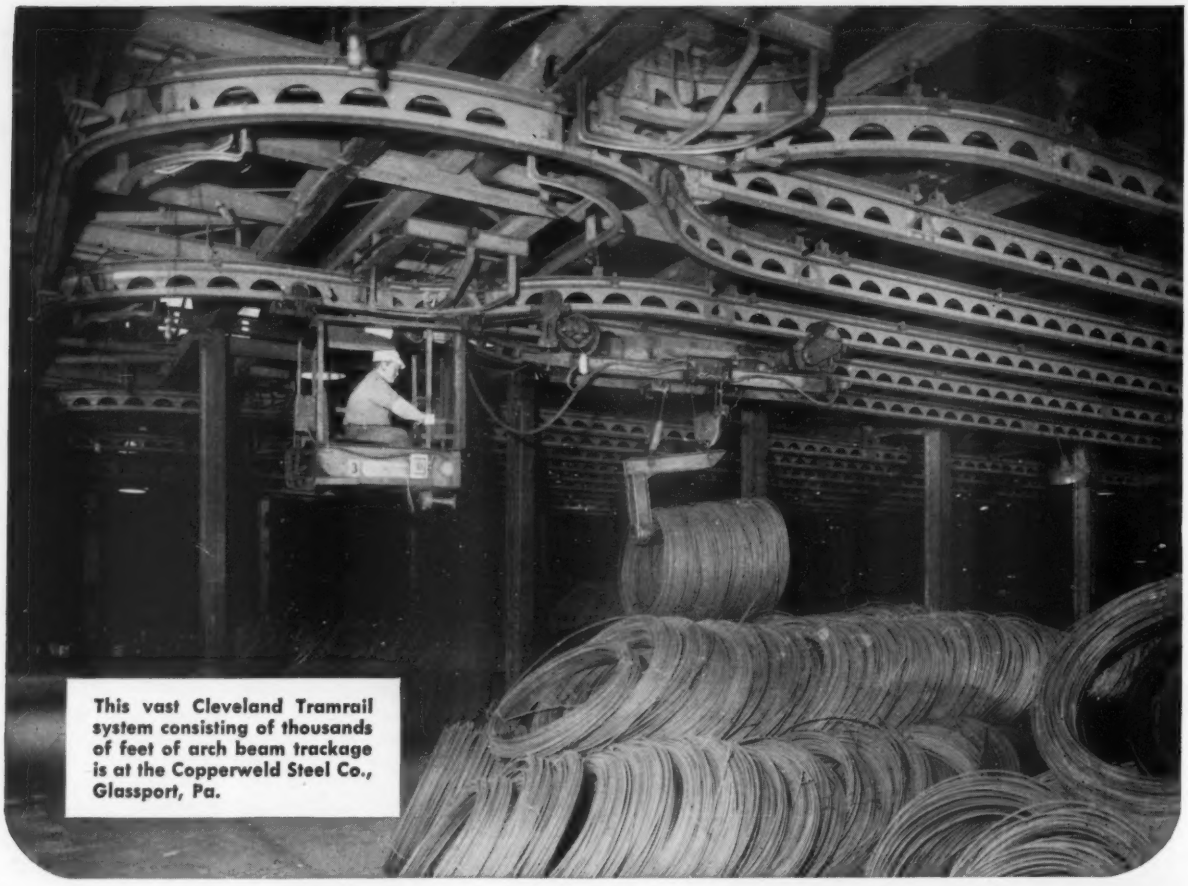

This vast Cleveland Tramrail system consisting of thousands of feet of arch beam trackage is at the Copperweld Steel Co., Glassport, Pa.

The *Most Practical* and *Lowest Cost* Method of Handling Wire and Rod

The headline words refer to overhead materials handling equipment and are powerfully strong, we admit. Yet we do not know of one engineer who is closely connected with the industry and experienced with all methods of handling, who will disagree.

Mills, large and small, from coast to coast, in the United States and Canada, have invested many millions of dollars in Cleveland Tramrail equipment to speed their wire and rod handling. The dividends that this huge investment has made possible, because of low-cost handling, have returned the original capital many times over.

If your company does not now enjoy the many benefits of Cleveland Tramrail, we urge you to get the "low-down" on what this equipment can do for you. A nearby sales engineer will be glad to give you the details without obligation.

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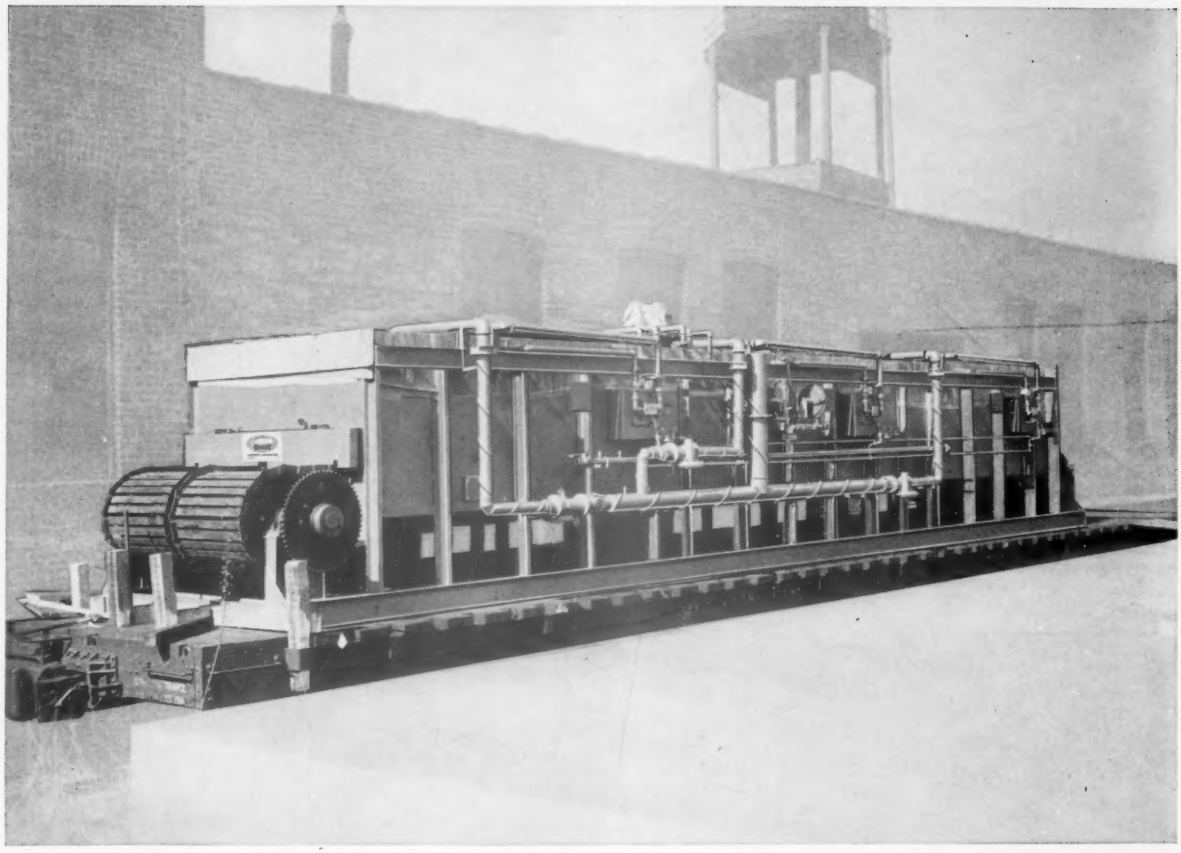
THE CLEVELAND CRANE & ENGINEERING CO.
9218 East 288 Street, Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT



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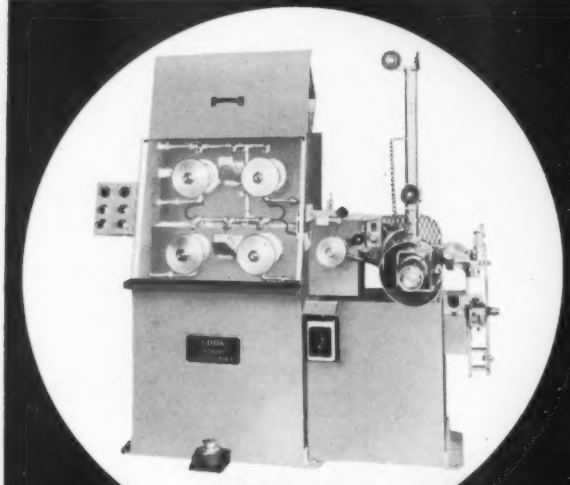
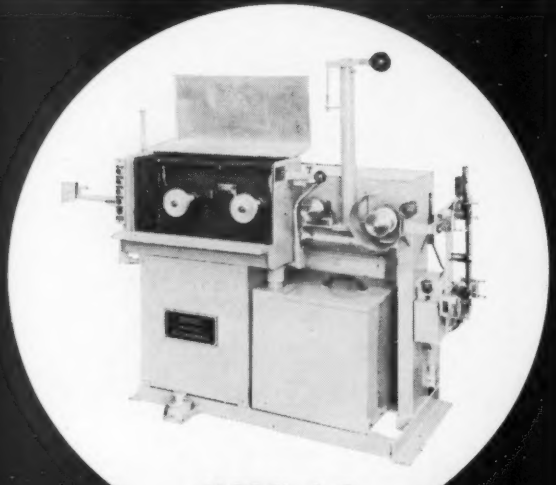
WIRE MILL

for money-saving, high speed wire production



MODEL F-31



MODEL A-9

SPECIFICATIONS

Maximum Wire Entering Size	#14 B&S Gauge
Finished Wire Size	#26 to 34 B&S Gauge
Operating Speed	5,000 ft./minute
Maximum Number of Dies	16
Number of Drawing Shafts	4
Size of Die Case	1" x ½" thick
Motor Size	15 HP
Spool Capacity	40 to 90 lbs.
Spool Flange Diameter	8" to 12"
Spool Traverse	6" to 8"

SPECIFICATIONS

Maximum Wire Entering Size	#24 B&S Gauge
Size of Finished Wire	33-44 B&S Gauge
Average Operating Speed up to	4,000 ft./minute
Maximum Number of Dies	9
Maximum Die Case	1" x ⅜" thick
Number of Drawing Shafts	2
Motor Size	up to 3 HP
Spool Capacity	10 to 20 lbs.
Spool Diameter	6"
Spool Traverse	4¾"
Floor Space	4'0" x 2'½"

From string-up to finished wire, every step in the operation of a Cook Wire Mill saves time, speeds production. Used individually or in combination, these Cook Wire Mills help you produce medium-fine and extra-fine wires at exceptionally low cost.

See what low cost, high speed production really is. Ask for complete details on Cook Wire Mills today.

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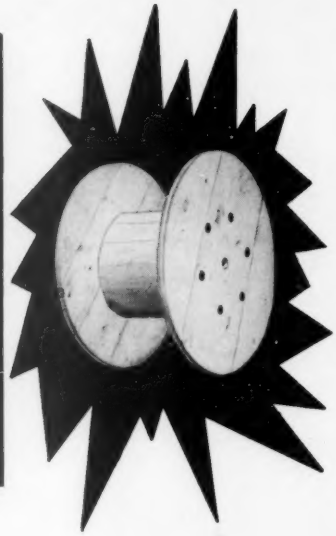

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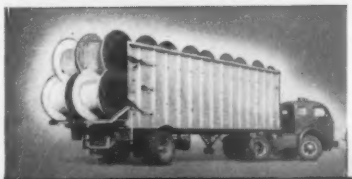

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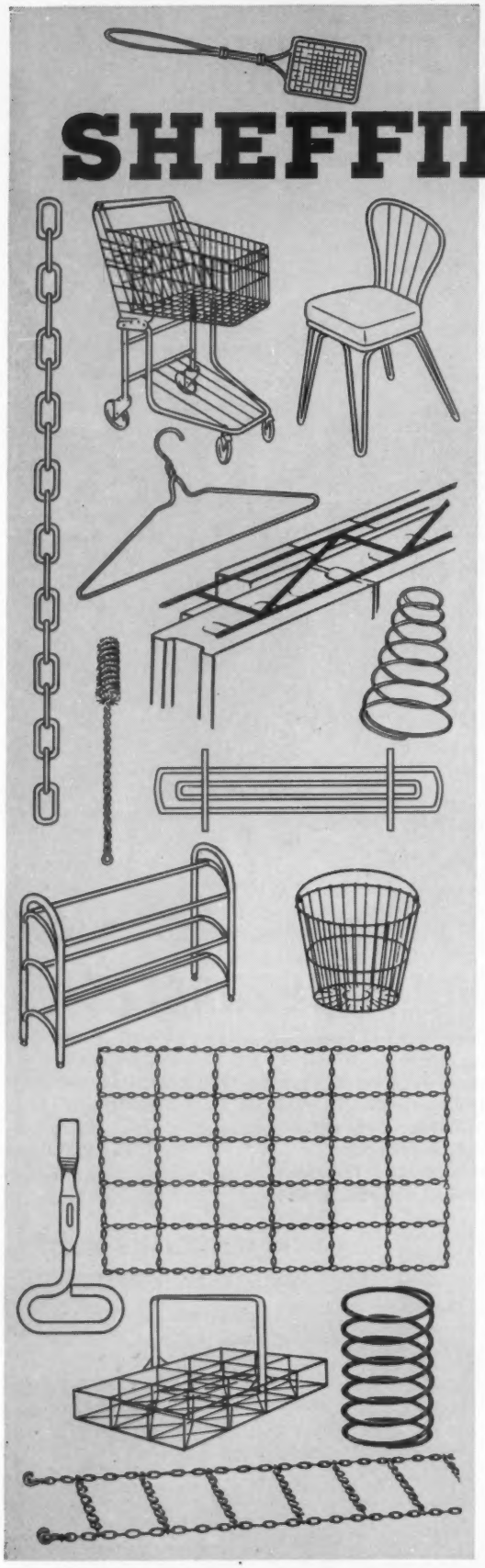
Let us quote on your reel needs. Send us your specifications. Better yet, visit our plant and see how and why Bridge reels are made so well at so low a cost.

WOOD REELS"



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Manufacturers and fabricators depend on Sheffield Wire for unvarying quality and accuracy in meeting their wire specifications. They are sure of getting the RIGHT wire—and getting it fast—because of Sheffield's advanced quality controls and strategic plant locations.

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gives you in one continuous spool the equivalent of 2 to 40 ordinary coils of wire. It gives longer continuous runs, less down time, and can cut scrap losses as much as 90%. The Kone Pak is mounted on a disposable wooden pallet, and can be packed in streamlined cardboard container if desired.

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Galvanized—#20 (.035" ga.) through #4 (.225" ga.)

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Flexal MCA is a specially formulated, high titer metallic stearate compound that is available only through Swift & Company. It is a homogeneous formulation that is very low in moisture—designed to help assure consistent performance, extended die life and maximum drawing mileage.

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It's designed to work with long and smooth efficiency at speeds ranging from 900 to 2000 feet per minute, through multiple draws on most ferrous alloys. It will pay you to *check the specs* on FLEXAL MCA; then return the coupon for details—or a trial order for use on your own equipment. See for yourself . . .

One trial is better than a thousand claims

- Homogeneous formulation
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The THERMATIC Series has a new, larger THERMA-FIN* system for *precise temperature control* even at maximum production speeds.

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You'll be amazed at how trouble-free production is with Payoffpak, too. There are no turning reels to contend with in a Payoffpak. That means you are never slowed up by backlash, overrun or inertia problems.

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Our engineering and production staffs regard wire as an important tool which can be designed and made to fill the exact requirements of our customers. Over the years PAGE has maintained a progressive attitude which has pioneered many "**firsts**" in the wire business. Among this list are items such as—

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" " commercial producer of Aluminized Wire
" " to produce and promote Stainless Steel Strand
" " Woven Wire Fence
" " Stainless Steel Fence
" " All-Aluminum Fence

Above all, PAGE is a dependable wire source. Many of our customers have grown with PAGE for nearly half a century. PAGE experience, talents and facilities are available to you at all times. We will be glad to work with your people in analyzing your wire needs, and if found advisable, in developing a new wire specification which may add to the usefulness and value of your own product.

PAGE - a Dependable Source for GENERAL WIRE

Partial list of PAGE General Wire materials, sections and special purpose wires:

MATERIALS	SECTIONS
Low Carbon	Rounds
High Carbon	Half Rounds
Low Alloy	Ovals... Flats
Stainless Steel	Half Ovals
Armco Ingot Iron	Squares
Aluminized	Special Shapes

SPECIAL PURPOSE WIRES

Aircraft	Signal Corps
Antenna	Spiral Binding
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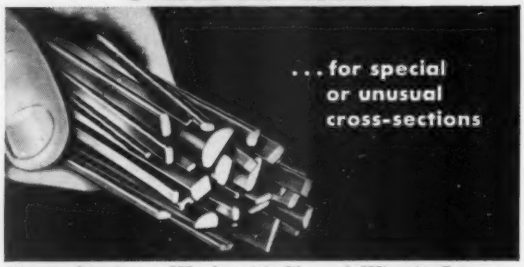
Belt Hook	Spring, Upholstery
Broom	Stapling
Buckle	Stitching, Automotive
Button Fastening	Strand
Clip	Telephone
Core (ACSR)	Telegraph
Hairpin	Thermocouple
Lashing	Tire Bead
Lock Washer	Weaving
Safety, Lock	Welding
Shaped (see next column)	(see next column) —and others

PAGE - a Dependable Source for SHAPED WIRE



Many Grades • We furnish Shaped Wire in Low or High Carbon, Aluminized, Low Alloy or Stainless Steel, and in Armco Ingot Iron.

Many Sizes • Cross-section areas to and including .0625 sq. in. Flats and rectangles to 3/8" (width-thickness ratios to 6:1). Also rounds, half rounds, ovals, half ovals, squares, and specials.

Packaged Right • PAGE Shaped Wire—in standard or special coils or in random, exact or multiple lengths, is packaged as you want it: bare bundles, waterproof paper-wrapped, burlapped, boxes, cartons, Leverpaks—palletized on request.

***(SPECIAL NOTE** • We do not stock finished shapes We manufacture to customer specification)*

PAGE - a Dependable Source for HELPFUL LITERATURE

SHAPED WIRE • *Booklet DH1226*
Here is a 16-page booklet that is crammed full of useful information of value to every wire user. It tells you how to cut costs with PAGE Shaped Wire. It gives complete information on available grades of steel...tempers and finishes...size range, etc. It explains what information to include on inquiries and orders.

Also, **Booklet DH1226** contains page after page of useful standard tables, among which are:

- **Mensuration Factors • Carbon and Alloy Steel Weights**
- **How to Calculate Areas of Common Shapes**
- **Physical Properties of Steel Wire**
- **Decimal Equivalents • and many other useful tables**

You will find this booklet of great value.
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"ACCO ALUMINIZED" WIRE
Folder DH537 • You will want the complete facts on the amazing new "ACCO ALUMINIZED" wire—the wire that combines the strength of steel with the corrosion-resistance of aluminum. **Folder DH537** explains how this revolutionary new wire provides double protection...tells how its unusual physical properties make it superior for almost endless regular and special wire applications. "ACCO ALUMINIZED" wire is an exclusive PAGE product.

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AMERICAN CHAIN & CABLE

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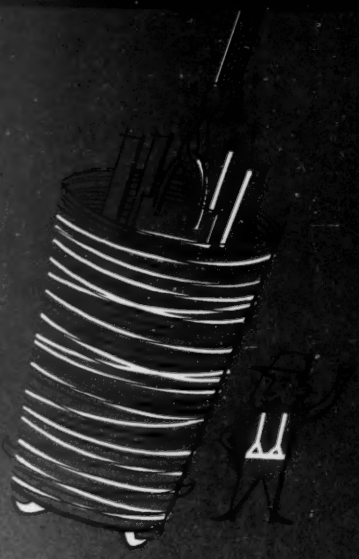

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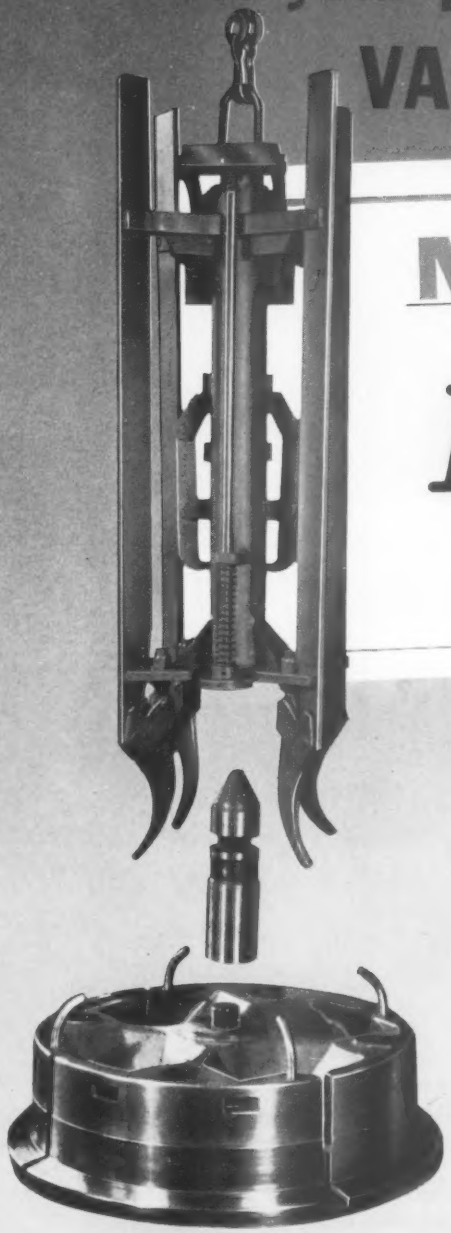

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LO-BLOC®

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Here is a direct, low-cost means of securing BIG BUNDLES from the Vaughn Motoblox® now on your wire mill floor—convert with the new Vaughn LO-BLOC!

The easily-installed combination of Lo-Bloc, pintle and collapsible stripping spider will permit true big-bundle production in your present operation, easy handling, better profits! • Ask us to detail the facts for you.

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LOWEST COST THREAD ROLLER

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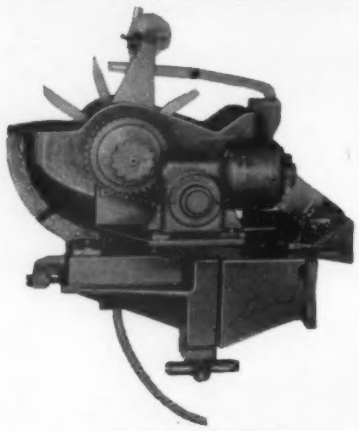
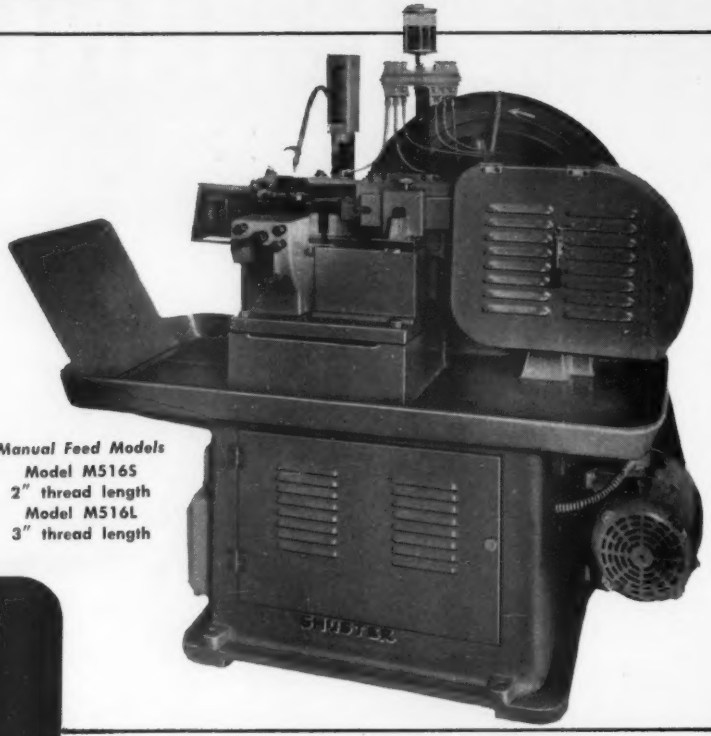


Hopper Feed for Models H516L and H516S.



Manual Feed Models
Model M516S
2" thread length
Model M516L
3" thread length

SPECIFICATIONS

- No. 6 to 5/16" diameter thread, ferrous
- 2" or 3" maximum lengths
- Manual or Hopper feed
- Four models
- 60-120 pieces per minute
- 3 H P Motor or U.S. Varidrive

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Low Cost thread rolling is *now* available! Here is a brand new, thoroughly tested, compact and rugged machine for both the small and large producer.

The Shuster Thread Roller offers you all the flexibility of production that different dies will allow, such as machine screws, gimlet pointed wood screws, and knurling, etc., at extremely low initial investment. Complete details and prices available on request.

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Fast Operating Utility Type Models J-3-S & J-4-S Automatic MICRO-WELD Butt Welders For Steel And Steel Alloy Wire

MICROMETER PRECISION MICRO-WELD ®

Model J-3-S and J-4-S MICRO WELD Butt Welders for steel wire.

These welders are used for welding high and low carbon Steel & Steel alloy wire ranging in size from .020″ to .160″ diameter.

All operations on these units, which include clamping the wire, contacting the weld switch, and applying the upset spring pressure, are made by a single downward stroke of the foot pedal.

Model J-3-S Welder
Capacity .020″ to .080″ diameter.

Model J-4-S Welder
Capacity .040″ to .160″ diameter.
STEEL, STEEL ALLOYS,
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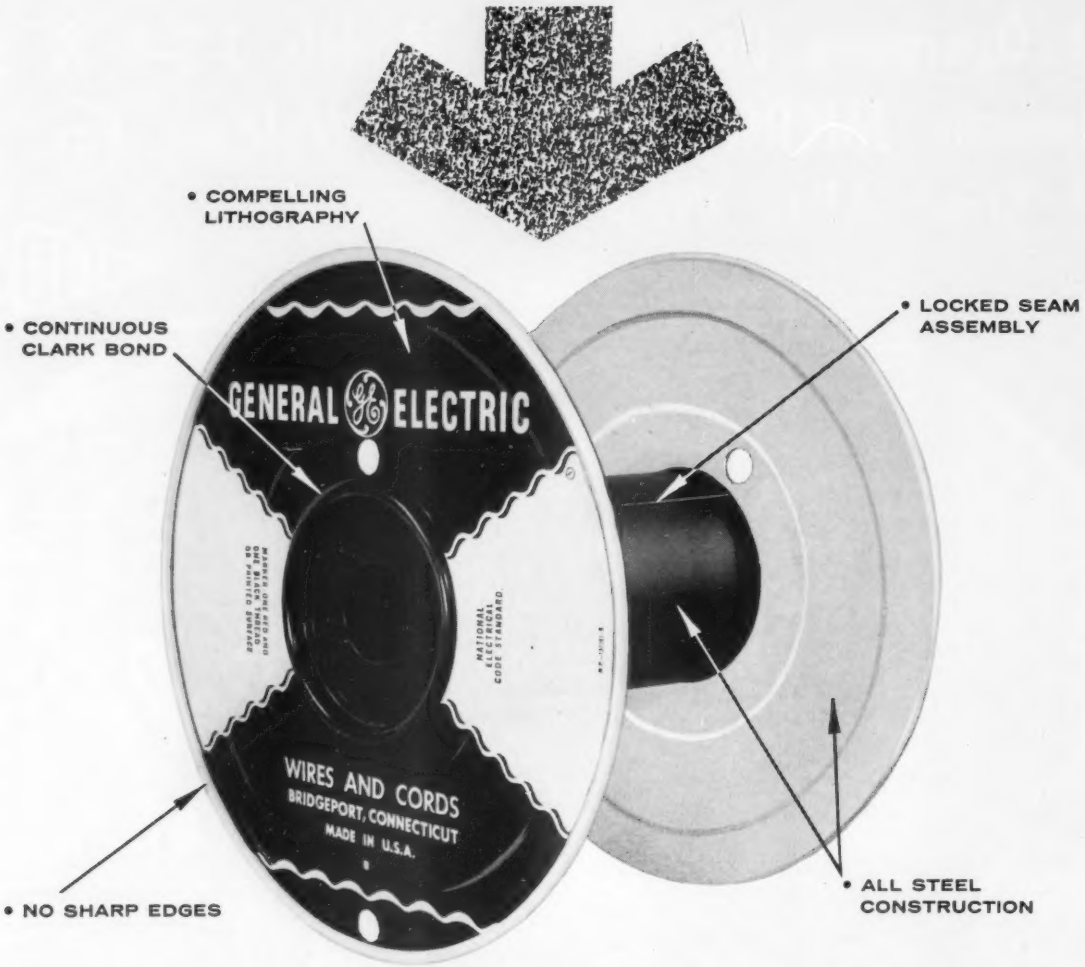

these CLARK features assure strength, saleability, safety

Custom-styled to sell your product, a J. L. Clark spool embodies the finest achievements in spool technology. It features brilliant lithography for instant brand identification . . . creative engineering for safe usage and handling ease . . . sturdy steel for unrivaled strength and safety . . . no sharp edges to cut or injure hands or product. A continuous bond between barrel and head eliminates independent turning of end, cap or center. Special reinforcement of this bond is provided by nibs impressed into the cap, a process usually applied to spools of 6½" end diameter and under.

Clark spools for insulated wire are available in standard end diameters of 3¾", 5", 6½", 10½" and 16½". Spools in specialized sizes and fine wire spools are also available.

For full details, ask for our booklet, "Spools for Insulated Wire." Learn how Clark's integrated services and half century of experience can work with you to help develop and design sales-building spools. *J. L. Clark Manufacturing Co., Rockford, Illinois.; Liberty Division Plant and Sales, Lancaster, Pa.; New York Sales Office, Chrysler Bldg., New York 17, New York.*

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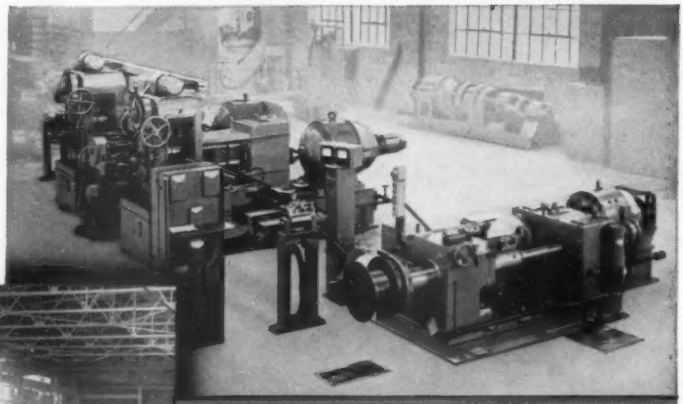
Roebling... Your Product is Better for it

Waterbury Farrel Wire Flattening MILLS IN ACTION

Pictured here are a few of the many Wire Flattening Mills designed and built by Waterbury Farrel. Each installation was custom-engineered to fit the production requirements of each individual customer.

Whether your requirements call for a single or multiple stand mill, Waterbury Farrel can supply you with a reliable production unit that will prove to be a profitable investment.

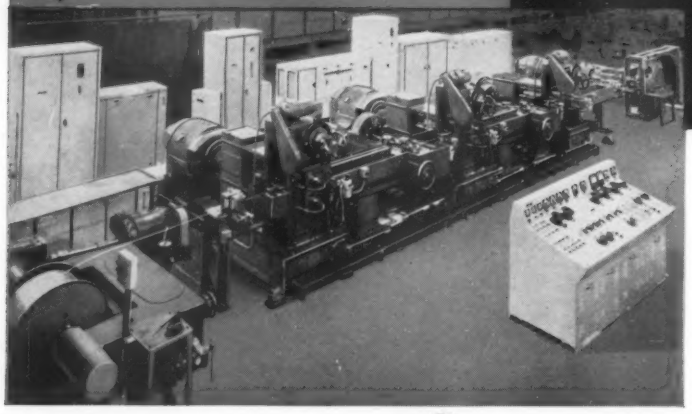


▲ Two Stand Tandem Wire Flattening Mill at National Electric Coil Co., Columbus, Ohio. Speeds up to 1000 feet per minute.

Two Stand Tandem Wire Flattening Mill recently installed at John A. Roebling's Sons Corp., Trenton, N. J. Speeds up to 1500 feet per minute.. ▼

▲ Three Stand Tandem Wire Flattening Mill in production for Anaconda American Brass Co. Ltd. (Subsidiary of the American Brass Co.) New Toronto, Ontario, Canada. Speeds up to 1800 feet per minute.

Three Stand Tandem Wire Flattening Mill installed at General Electric Co. in their Pittsfield Works. Speeds up to 2500 feet per minute.. ▼



Write today for your free copy of Wire Flattening Mills, Cir. No. 731-R.

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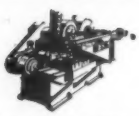
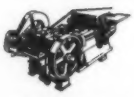
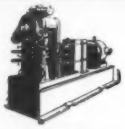
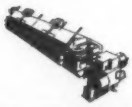
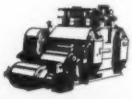

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WF-32

U.S.I.

Vol. II, No. 5

POLYETHYLENE PROCESSING TIPS

HOW CARBON BLACK QUALITY AFFECTS WEATHER RESISTANCE OF POLYETHYLENE

For cable jacketing and many other outdoor applications polyethylene offers substantial advantages over other materials. It is subject, however, to degradation from long exposure to sunlight unless the resin is properly protected.

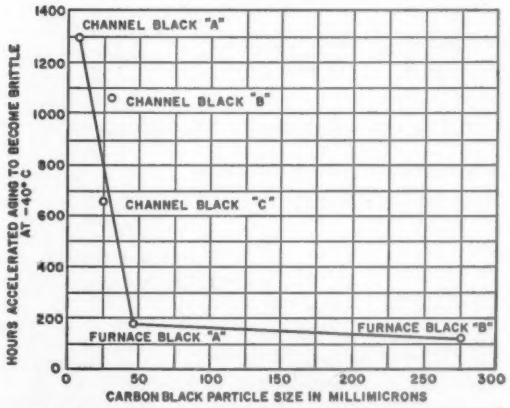
Actually, the aging of polyethylene is the result of a chemical reaction with atmospheric oxygen. Catalyzed by the ultraviolet rays in sunlight, this reaction proceeds more rapidly in outdoor use than is the case with indoor applications. The principal effects of aging are to increase brittleness at low temperature, and to decrease the resistance to stress cracking.

Carbon black dispersed throughout the polyethylene greatly retards this aging, or weathering. However, not all carbon blacks produce the same degree of weather resistance when dispersed in polyethylene. Moreover, the care with which the carbon black is dispersed in the polyethylene is vitally important.

The weather resistance of a polyethylene compound depends on: (1) type and particle size of carbon black; (2) percentage of carbon black in the compound; (3) the dispersion of the carbon black in the polyethylene.

Accelerated aging tests have been devised to approximate the action of years of outdoor exposure.

The graph below shows the great difference in number of hours required in these tests for a polyethylene to embrittle at −40°C when various carbon blacks having different particle sizes are used.



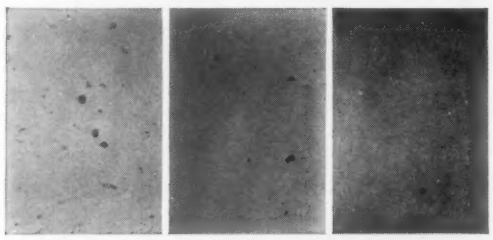
EFFECT OF CARBON BLACK PARTICLE SIZE ON ACCELERATED AGING OF POLYETHYLENE.

The two at right are "furnace blacks", and it will be noted that they are comparatively ineffective. The three at the left are "channel blacks", and obviously, they are many times more effective. This is due to their much smaller particle size – from about 10 to 25 millimicrons, against 50 to 275 millimicrons for furnace blacks.

Weather resistance also increases with the concentration of carbon-black – up to a point. Beyond this point the light screening effect is offset by a decline in other properties.

DEGREE OF DISPERSION IMPORTANT

Carbon black gives maximum protection only when it is thoroughly dispersed in the polyethylene. This presents a difficulty because the smaller the particles, the greater is their tendency to collect into clusters which, once formed, are hard to break up. Tests show that a good dispersion will withstand 15 to 20 times as much exposure to sunlight as a poor dispersion.



POOR FAIR GOOD

MICROPHOTOGRAPHS OF CARBON BLACK DISPERSIONS IN POLYETHYLENE.

The wire and cable grades of U.S.I.'s PETROTHENE polyethylene resins employ only the finest "channel black" carbon black. Concentration is set at a point which yields the optimum balance of light screening and other properties. Special processing equipment insures thorough dispersion. The result is black polyethylene that withstands long, severe outdoor exposure, yet affords the practical maximum of tensile and other properties.

If you fabricate or use black polyethylene, ask U.S.I. for complete technical data on PETROTHENE resins expressly formulated for weather resistance.

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Wire range up to ..... .080" dia.
Strip range up to ..... 9/16" width
Length on wire intake per item ..... 6" or 14"
Output ..... up to 350 pieces per minute.

This machine, manufactured in West Germany by Bihler Company, is designed to combine up to 16 operations, including stamping, sawing, threading, electric point welding, manufacturing of torsion springs, etc.

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Pittsburgh PX-120 (DiIso Decyl Phthalate) offers you a unique combination of properties which make it especially suitable for the economical production of vinyl-jacketed electrical wiring.

PX-120 possesses excellent low-volatility, a prime consideration in vinyl wire insulation, especially where higher-than-normal temperatures are encountered. For additional retention of elongation on aging, Pittsburgh PX-120 can be supplied with Bisphenol A added.

Whatever your vinyl product, you can count on PX-120 for good permanence, resistance to extraction, and low temperature properties . . . plus a low specific gravity that enables you to enjoy appreciable economies on a pound-volume production basis.

May we acquaint you further with this versatile plasticizer? Write for samples and technical data.

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PX-104 DiButyl Phthalate	PX-208 DiIsoOctyl Adipate
PX-108 DiIsoOctyl Phthalate	PX-212 n-Octyl, n-Decyl Adipate
PX-114 Decyl Butyl Phthalate	PX-218 IsoOctyl Decyl Adipate
PX-914 Butyl Octyl Phthalate	PX-220 DiIso Decyl Adipate
PX-118 IsoOctyl Decyl Phthalate	PX-238 DiOctyl Adipate
PX-120 DiIso Decyl Phthalate	PX-404 DiButyl Sebacate
PX-138 DiOctyl Phthalate	PX-438 DiOctyl Sebacate
PX-313 Modified Alkyl Phthalate	PX-800 Epoxy
PX-314 n-Octyl, n-Decyl Phthalate	PX-917 TriCresyl Phosphate

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WIRE ROPE PRODUCTION EQUIPMENT FOR SALE

We offer for sale equipment comprising a complete wire rope plant capable of producing steel wire ropes in all sizes up to 1" diam. Suitable for copper or aluminum up to 1¼" diam. Can strand in one operation from 7 to 37 wires and beyond in multiple operation. Suitable for concentric reverse lay one operation tandem stranding with minor modification. Machinery is of novel design; occupies minimum floor space; quiet operation; adjustable while operating; wide versatility of construction ranges. Offered at unusually low price providing opportunity for prospective buyer to establish wire rope manufacturing plant at fraction of normal cost.

Closing Machine C-1—9 Cradle Closer. Has 75 HP motor. 875 RPM. Machine speed 220 RPM. Supply Bobbins: 32" flange, 16¼" drum, 14" traverse, 2½" arbor hole. Take-up capacity, 7500 feet of 1" rope, smaller sizes proportional. Produces ¼" to 1" rope. Can make 7 strand guy or utilities strand up to ½" diam.

Stranding Machine No. S-1—30 Cradle Strander, feeds Closer No. C-1. 75 HP motor, 870 RPM. Supply Bobbins: 14" flange, 7" drum, 6¾" traverse, 1¼" arbor hole. Take-up Bobbins: 32" flange, 14" traverse, 16¼" drum, 2½" arbor hole. Capacity: Strand for 7500 ft. of 1" diam. rope. Suited to making strand for 7/16" to 1" diam. rope. Set up for 30 cradles, but can take 37 or more.

Closing Machine C-2—7 Cradle Closer. 10 HP, 1150 RPM motor. Machine speed 430 RPM. Supply Bobbins: 15½" flange, 7" traverse, 8" drum, 1½" arbor hole. Take-up capacity 5000 feet or 7/16" rope, with smaller diameters proportionate. Suitable for making ¼" or smaller guy of utilities strand in 23,000 ft. lengths.

Stranding Machine No. S-2—19 Cradle Strander, feeds Closer C-2. 10 HP, 900 RPM motor. Machine speed: 700 RPM. Supply Bobbins: 6" flange, 3" traverse, 2" drum, ¾" arbor hole. Take-up Bobbins: 15½" flange, 7" traverse, 8" drum, 1½" arbor hole. Makes strand of ½" diam. at 1850 feet and 7/16" at 2350 feet. Smaller sizes proportional.

Stranding Machine No. S-3—37 Cradle Strander, feeds Closer No. C-2. 10 HP motor, 1150 RPM. Supply Bobbins: 6" flange, 3" traverse, 2" drum, ¾" arbor hole. Take-up Bobbins: 15½" flange, 7" traverse, 8" drum, 1½" arbor hole. Capacity: ½" rope, 1850 feet; 7/16" rope, 2350 feet.

In addition to the above, the following is offered:

- 2 6-Bobbin Planetary Stranding Machines. Supply bobbins: 4¾" flange. Holds 7 lbs. wire.
- 1 7-Bobbin Tubular Stranding Machine with Supply bobbins of 20" or 21".
- 1 12-Bobbin Tubular Strander, bar type. Supply bobbins: 6" x 3". Holds 11 lbs. wire.
- 2 19-Wire Tubular Stranders, bar type. Bobbins hold 60 lbs. of wire.
- 1 25-Wire Planetary Strander. Bobbins: 12⅝" x 7-3/16".
- 1 6-Swift Spooling Bench for wires from .004" through .045".
- 1 6-Swift Spooling Bench for wires from .014" through .070".
- 1 4-Swift Spooling Bench for wires from .016" through .100".
- 1 19-Wire Tubular Strander with supply bobbins with a capacity of 10 lbs. of steel wire.

The foregoing representations are believed to be accurate, but are subject to confirmation by prospective purchasers, who may arrange an appointment for inspection of the equipment at Sunbury, Pennsylvania.

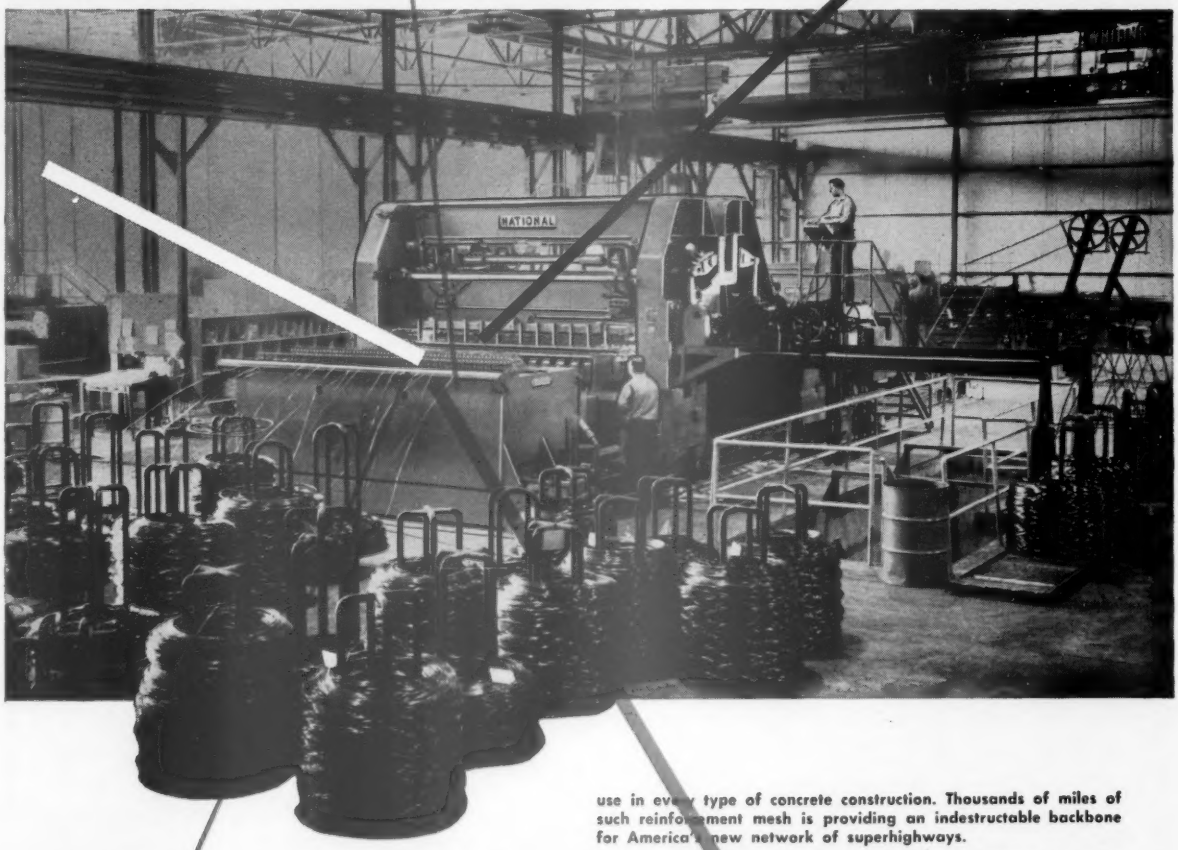
Please write for descriptive literature and make appointments through

WIRE AND TEXTILE MACHINERY, Inc.

80 FOUNTAIN STREET **PAWTUCKET, R. I., U.S.A.**

Telephone: PAwtucket 2-7750

this NATIONAL ELECTRIC UNIT is a completely automatic high speed wire mesh manufacturing plant



Starting with coils of line-wire, this National Electric Wire Fabric Welder automatically turns out welded wire mesh in a variety of sizes . . . and at surprising speeds. In a single hour, as much as 250 miles of wire is transformed into high-quality wire mesh for all kinds of uses including reinforcement in concrete construction, fencing, etc.

Beginning at a line wire straightener unit, each wire is passed over as many as 10 grooved, staggered rollers for straightening.

Next, the line wires pass over welding dies within the machine's welding unit. Here, under a pressure of 60,000 lbs., a mat as wide as 200" is welded at each junction-point, the cross-wires being fed in automatically, at whatever spacing may be indicated by the reciprocating indexing-platen.

The machine next shears rectangular mats to the required size or winds welded fabric into coils of desired length. Finished coils are automatically discharged onto a ramp . . . rolling away to the loading dock or warehouse.

The rugged, steel-mill design and construction of this machine makes it possible to efficiently weld as many as 120 cross-wires per minute. Since 1945, National Electric Wire Fabric Welders have been dependably turning out welded wire mesh in numerous sizes, for use in every type of concrete construction. Thousands of miles of such reinforcement mesh is providing an indestructable backbone for America's new network of superhighways.

Complete automation, the key to profitable production, is made possible in National Electric Welding machines by means of utilizing automatic feeds, radial feeds, automatic positioners, multi-head design, automatic discharge devices, motor-driven rotating fixtures and sequenced ejectors. By their speed and accuracy, National Electric machines achieve amazing savings in time, labor, and cost-per-weld.

Write today for complete information on National Electric Automatic Wire Mesh Welders or any other special or standard welding problem that you may have.

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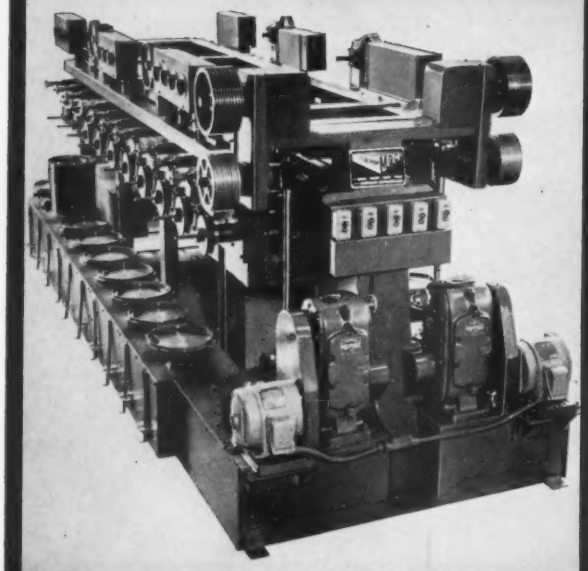
NATIONAL ELECTRIC WELDING MACHINES CO.

1880 N. TRUMBULL STREET
BAY CITY, MICHIGAN

25 YEARS EXPERIENCE DESIGNING AND BUILDING: SPECIAL & STANDARD • AIR • HYDRAULIC • MOTOR DRIVEN • SPOT • PROJECTION • SEAM • BUTT • FLASH • RESISTANCE WELDERS • PRODUCTION FIXTURES FOR ALL TYPES OF AUTOMATIC ARC WELDING.

NEW

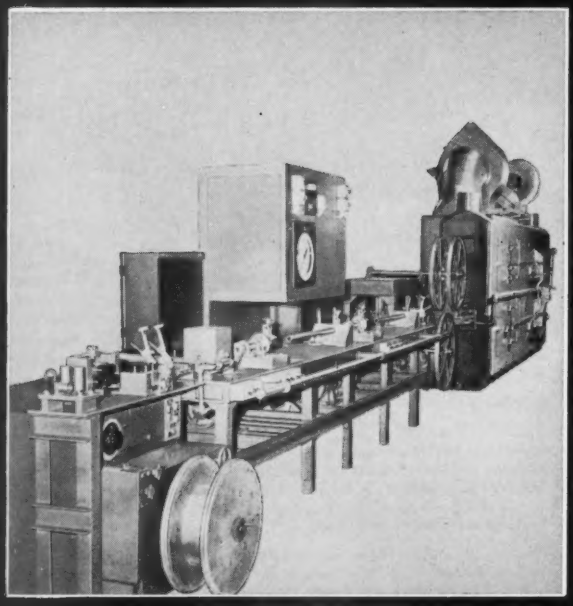


New Reel-R-Drum Packer handles two wire sizes simultaneously at different speeds through the same process.

MOCO's new Reel-R-Drum Packer is setting production records in forward-looking companies. This versatile unit has a speed range from 20 to 120 feet per minute. You can produce two wire sizes simultaneously through the same process at different speeds. Handling wire sizes ranging from .0089" to .025" in diameter, this MOCO Reel-R-Drum packages annealed copper magnet wire on different reels or in nominal 100 lb. capacity Payoffpak Drums, or both simultaneously. This versatile unit is built for tandem operation with a high speed MOCO type "C" wire enameling machine.

New MOCO Machine applies 2 servings of glass or yarn and 4 coats of baked insulating varnish

Satisfied users acclaim this new insulating, impregnating and varnish baking machine as a completely revolutionary development in the field of wire enameling. It is capable of turning out large quantities of heavy rounds and rectangulars (up to 150 M. Sq. Mls. Cross Sectional Area), baking on 4 coats of insulating varnish and applying two servings of glass or textile yarns . . . simultaneously! MOCO's revolutionary Rapid-Cool Oven lets you stop production without damage to wire in the oven. Return to full production in a matter of seconds because of the rapid rise of the temperature inside this MOCO Tunnel Oven.



FOR MORE INFORMATION

MICHIGAN OVEN COMPANY

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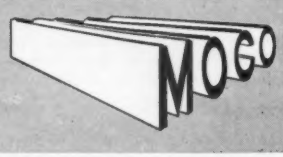

Coulter & McKenzie D-PAKer shown above

EASY LOADING • EASY DISPENSING • EASY STACKING

Forget about the time and trouble involved in splitting, tying and wrapping wire! Continental's Payoffpak accommodates up to 100 pounds of fine wire as fast as it's drawn or annealed. This is the most practical—and most economical—way to pack, ship, store and dispense fine wire, ferrous or nonferrous. Superbly lithographed by Continental to do a real selling job for you, Payoffpaks are economically priced for one-time use. Call or write Continental *today*.

CONTINENTAL CAN COMPANY

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Pacific Division: Russ Building, San Francisco 4

Payoffpak has a sturdy bail, smooth slick interior, and necked-in bottom for secure stacking. No need of reels or wide range of block sizes in filling . . . longer length of continuous strand means reduced downtime for your customers.

EITHER LUG OR RING SEAL TYPE CLOSURE PROVIDES TRUE AIRTIGHT SEAL!

NEW JLE OPEN-SIDE Measuring Machines

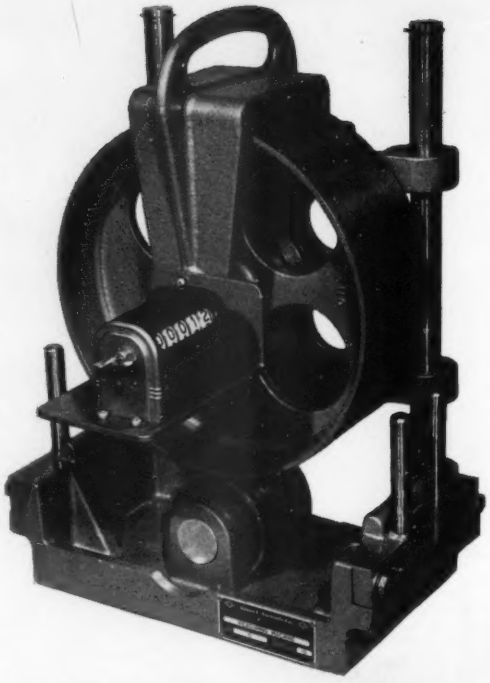
A Complete Line Covering Every Wire and Cable Measuring Requirement

Regardless of the size or type of your wire or cable, or the measuring speeds necessary to meet your production schedule, there is a JLE Measuring Machine especially tailored to fit the need!

Available in both two- and three-wheel models with sealed-for-life ball bearings, all machines, with the exception of the three-wheel Type HS, are open-side-loading to eliminate threading.

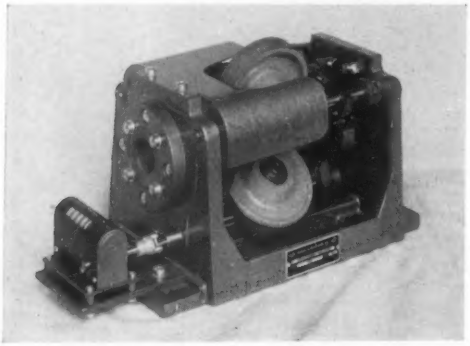
In all models, wheel weight and surface are accommodated to the material being measured, and include iron, steel-sprayed aluminum, Disogrin plastic rim on aluminum, and durable synthetic rubber rim on aluminum. All machines are equipped with springs to automatically reduce the pressure on small diameter wire.

The various machines are capable of measuring everything from heavy wire rope and armored cable at relatively slow speeds, down to the finest small diameter wire at speeds of up to 2,500 feet-per-minute.



JLE Two-Wheel Measuring Machine Class C, Type C, 3½" O.D. wire capacity. Entire measuring assembly slides on hardened steel guide rods, keeping wheels in exact vertical alignment, and giving accurate measurement of various diameters without adjustment.

A wide choice of counters is available to suit each particular situation, and can be mounted at right angles or parallel to the wire line on the left or right side, or, by means of a flexible shaft assembly, in a remote location. Types include a 5-figure knob-reset revolution counter, 5-figure quick-reset electric-contact-making counter, or a large, 6-figure key-reset totalizing counter. Other types can be furnished to meet special applications.



JLE Three-Wheel Measuring Machine, Class H, Type HS, 1" O.D. wire capacity for accurate, high-speed measurement of single-conductor and twisted-pair. Model illustrated is equipped with small, high-speed, knob-reset counter, heanium wire guide bushings, and aluminum wheels with steel-sprayed rims.

Optional extras include Wax Scrapers, Brakes, Yard or Meter Measurement, Tachometers, Cable Roll Guides, Stands, and Flexible Shaft Assemblies.

Two-Wheel Measuring Machine models are as follows: Class A, up to ½" O.D. wire; Class B, up to 1½" O.D. wire; Class C, up to 3½" O.D. wire; Class D, up to 6½" O.D. wire.

Three-Wheel Measuring Machine models are as follows: Class H, up to 1" O.D. wire (closed model); Class J, up to 2" O.D. wire (open side); Class K, up to 4" O.D. wire (open side).

A small, single-wheel, capstan-type measuring machine is also available for twisted-pair telephone wire.

ASK FOR CATALOG SECTION 11C

James L. Entwistle Co.

SPARKING THE WIRE INDUSTRY SINCE 1918 JLE

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OUR NEW, MODERN, AIR-CONDITIONED FACTORY WILL BE READY IN JULY

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NOT CONNECTED WITH ANY FIRM OF SIMILAR NAME

ENGLAND

General Engineering Co. (Radcliffe) Ltd.
Station Works — Bury Road
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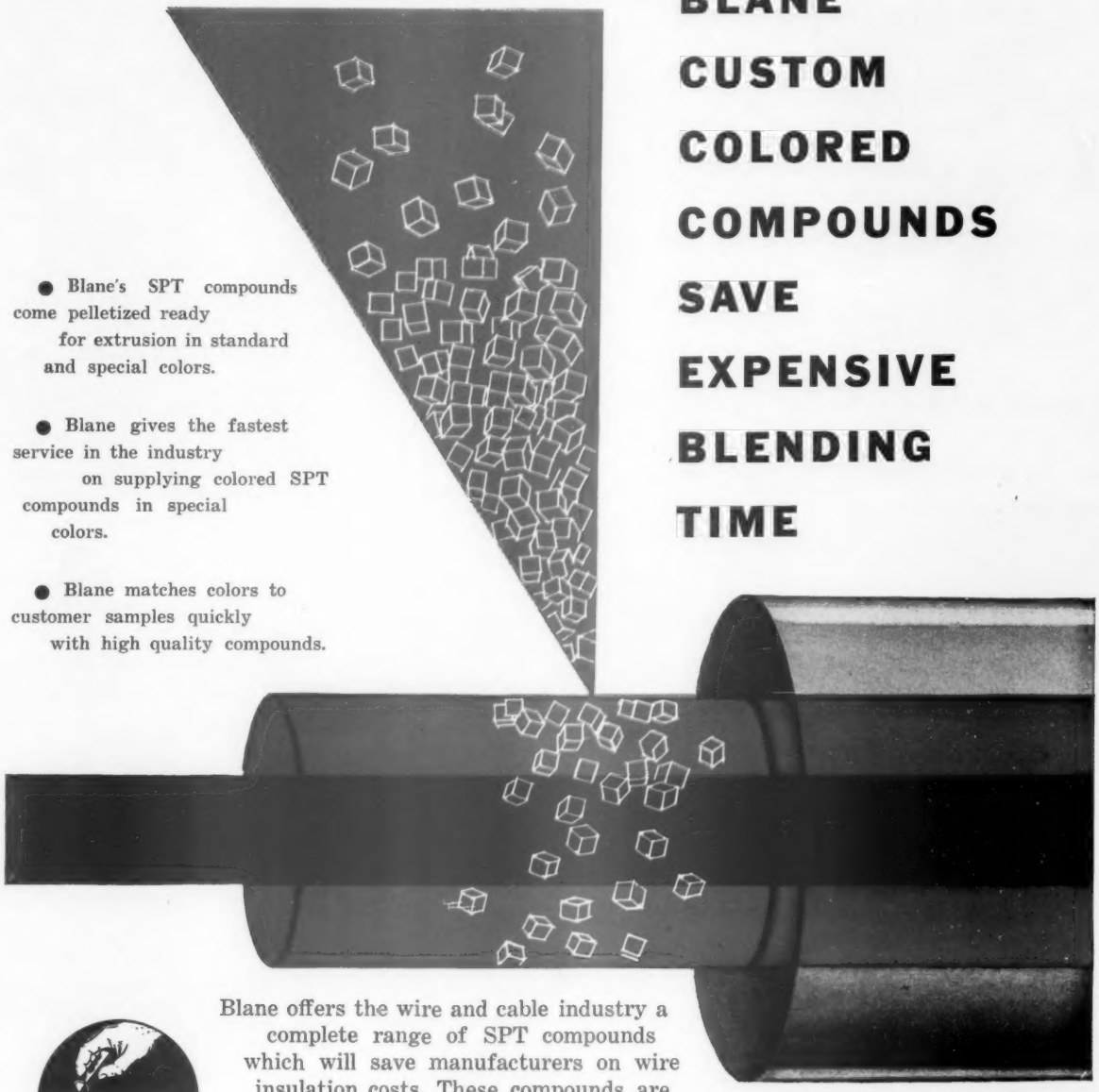
BLANE
SPT
COMPOUNDS



BLANE CUSTOM COLORED COMPOUNDS SAVE EXPENSIVE BLENDING TIME

- Blane's SPT compounds come pelletized ready for extrusion in standard and special colors.
- Blane gives the fastest service in the industry on supplying colored SPT compounds in special colors.
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BLANE

Blane offers the wire and cable industry a complete range of SPT compounds which will save manufacturers on wire insulation costs. These compounds are designed to meet UL requirements. And Blane laboratory specialists are ready to assist you on any color problem. Write for samples, technical data, and prices.

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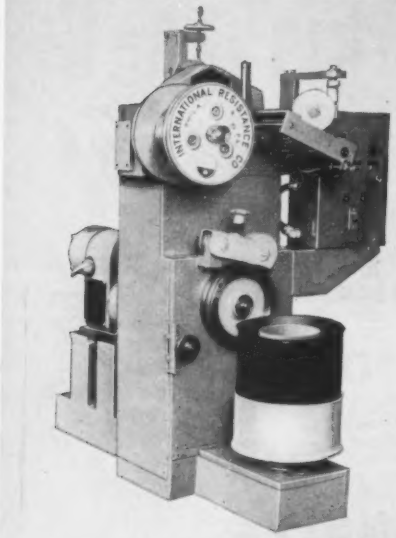
COULTER & McKENZIE

CONSTANT TENSION DRAW-PAK EQUIPMENT

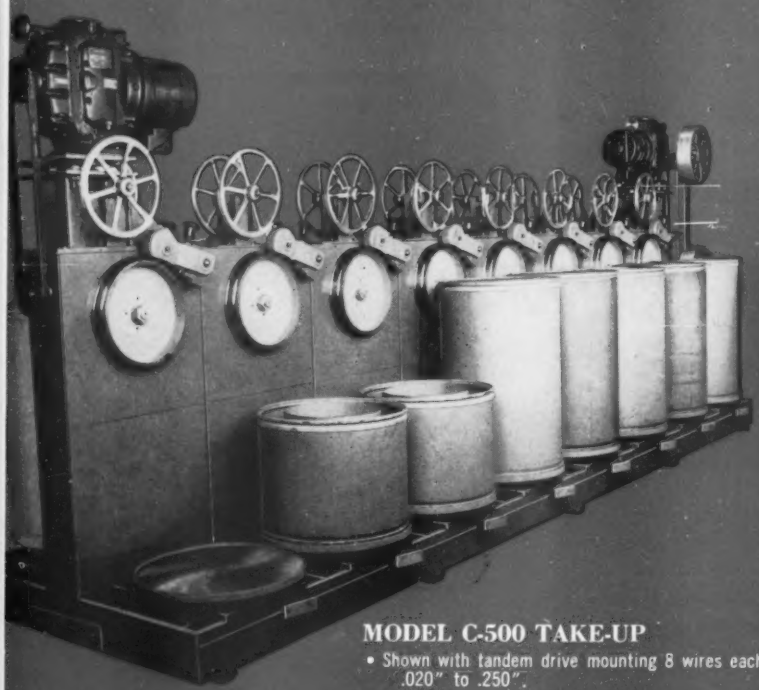
FOR CONTINUOUS WIRE PACKING & DRAWING



- Combination drum or spool take-up and rewinder.
- Shown for single wire.
- Adjustable for tension, pitch and amplitude of traverse.
- 12" spool shown. 30 to 150 lb. drums.

MODEL C-100 TAKE-UP

- Shown with single drive mounting to 16 wires .008" to .051"
- Enameling, annealing, galvanizing, tinning, etc.
- Containers 30 to 150 lbs.



MODEL C-500 TAKE-UP

- Shown with tandem drive mounting 8 wires each side .020" to .250".
- Galvanizing, patenting, enameling, etc.
- Drum or adapter weights 200 to 1,000 lbs.

MODEL 138-A DRAW BLOCK

- Single draft wires .016" to .375"
- "Draw-cast" die box shown gives adjustable positive cast control. Also available in other sizes.
- Process adapters to order — drums to 1,000 lbs.

ur inquiry specifying the application which is of interest you will result in prompt and courteous attention.

Pat. No. 2,732,060. Other U.S. and foreign patents pending.

35 UNION AVENUE

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THE COULTER & McKENZIE MACHINE CO., INC.

SINCE 1843 BRIDGEPORT 7, CONNECTICUT, U.S.A. INCORPORATED 1881

The Wire Outlook

Subnormal business activity still continues but there are some signs of an up-turn.

Steel production moved up for the first time in many weeks early in May to a general average of 50%, partly due to a number of idle furnaces being re-fired. One steel company head predicts that by the end of the year, mills will be operating at around 75% of capacity. Automotive production will remain at a low ebb on 1958 cars, some 20% off from last year, since the public has not reacted well to them. Car makers are now pinning their hopes on the '59 models, which will be introduced earlier than usual with many changes. They will be lower, longer, and wider, if anything, but not more powerful. Emphasis is to be placed on greater economy of operation and new styling.

Offsetting the state of affairs that exists, hard-headed stock market traders have registered their confidence in the future. Stock prices have advanced out of proportion to current profit and loss showings, and it is to be hoped that their judgment is correct. Employment has moved up a little, housing starts are better, and here and there better business is reported.

People are showing more caution in buying consumer goods, probably because so many have been out of work and because, in the face of the rising cost of living index, incomes just won't stretch as far as before.

At this time, although resisted by the Administration, tax cuts that would put more spending money in the pockets of consumers would go far toward giving the economy a boost. It is still predicted that the Government will have to yield on tax reductions.

Total economic activity during the first quarter was at an annual rate of $424 billion, which is $8.5 billion lower than the preceding quarter and $6 billion under 1957's first quarter—nearly 1½% less. The GNP for the year is expected to wind up at $425 billion. In 1957 it was $434.5 billion.

Personal incomes for the first three months of 1958 were at an annnual rate of $341.5 billion, one and a half percent less than a year ago.

Spending for "hard" goods—autos, appliances, furniture, etc.,—dipped $2.9 billion to $31.5 billion in the first quarter. For "soft" goods and services, spending increased. Food, clothing and other nondurable purchases rose $.7 billion over the last quarter of 1957 and for services it jumped $.8 billion.

Slow in starting, merchant wire product sales have at last picked up. Some producers report sharp increases in orders. Strand for prestressed concrete is selling better. Wire fabric demand has risen about 15%. Cold heading orders have been quiet. Most orders for manufacturers' cold heading and spring wire are for short term needs. One bright spot for wire is in brass mills. While copper-base alloy mills are doing less total business, the wire end is holding up well.

It is estimated that, apart from such things as automotive production, about 66% of the slowdown can be attributed to inventory liquidation. There has been little or no forward buying and companies with stocks on hand have been getting themselves down to a strictly hand-to-mouth basis. Most such inventories are down to rock bottom.

Again we face the old question of public confidence. Should too many people become convinced that bad times are ahead, business cannot but be affected. Sentimental or artificial optimism, too, can only lead to delusions. Nor is the recession going to be cured solely by Washington.

The good factor about the situation is that big economists and big business leaders, who can't afford to make rash predictions, almost unanimously agree that an upturn is sure to come in the near future. With this conviction, the majority of people are in accord.

Edmund Duval Sickels
EDITOR

Specify STEELSKIN

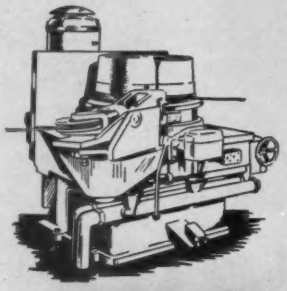
for dependable lubricants... dependable results!

It's fundamental!

1 You hire technicians, you hire engineers who have experience, know-how and integrity... because you know you can depend on them to do their jobs.

2 You buy machinery—from manufacturers on whom you have learned you can depend for quality equipment—manufacturers who stand squarely behind the products they produce.

You know you can depend on them.



Shop foremen who have tried Steelskin lubricants *know* they can depend on Steelskin's consistent quality year after year... know they can rely on Steelskin's uniform composition, and texture. They know that Steelskin gives greater die-life, more uniformity, better quality in the wire products they produce. What's more, they know Steelskin's engineers are always ready to assist them with wire-drawing problems.

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WIRE
AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 33 JUNE, 1958 No. 6

A Method of Analyzing Wire Coatings on Copper Using Standard Metallographic Practices

by Dewey Myers, Jr.
Metallurgical Development Engineer
General Electric Company
Materials Engineering Laboratory
Medium Transformer Department
Rome, Georgia

Introduction

New results are being obtained from standard metallographic practices. A new technique has been developed which permits the examination of film on rectangular wire. Etching of samples of wire coated with Formvar-type enamels reveals individual layers in the coatings. The samples can be prepared in any rudimentarily equipped metallographic laboratory. When a change in die design or arrangement is desired, this technique can be a valuable tool in determining the optimum arrangement or design. If trouble develops in an existing enameling operation, this technique could be used to determine at what die or at what step in the process the trouble is developing. New operations just starting into production could also use this technique as a method of checking the process by comparing samples with those from enameling operations which are producing good wire.

Dewey Myers, Jr.

The author describes a new technique for examining film on rectangular magnet wire as a useful means for studying coatings in the laboratory. Mr. Myers graduated from the University of Alabama in 1954 with a degree of MS in Metallurgy. He joined G.E. in 1954 as an engineer and has been in the Materials Engineering Laboratory at Rome for the past year.

Application

The advantages which this technique will give the observer when multipass wire is being examined are:

1. **Aid in determining the builds and variations in individual layers.**
2. **Aid in determining the optimum number and best arrangement of dies to be used for a total desired build.**
3. **Data obtained will aid in determining the best design for dies.**

Limitations

At present, the process is limited to use with Formvar-type enamels. Future work may make the use of this technique possible with other types of enamel coatings for wire. More than normal care must be exercised in the preparation of the specimens since the coatings are softer than most materials prepared for microscopic examination in a metallographic laboratory.

Procedure

The samples are prepared in the

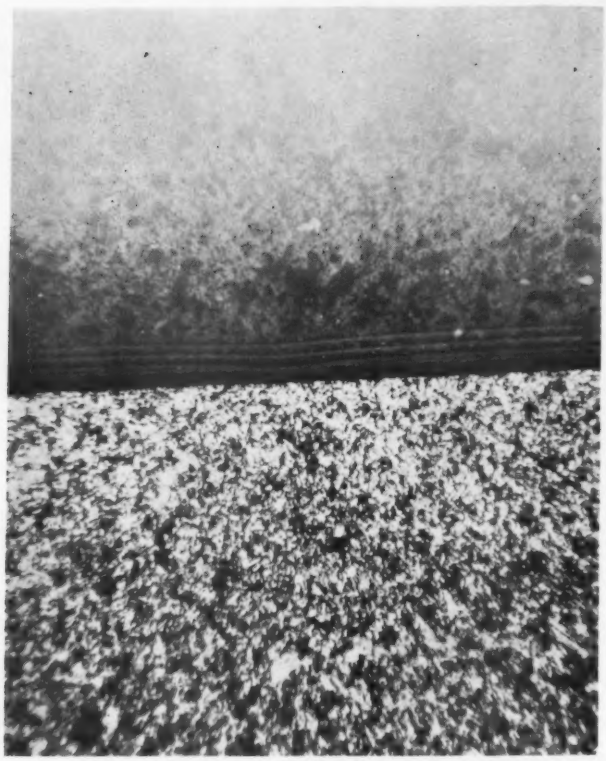


Fig. 1A (left) A FLAT AREA ON RECTANGULAR WIRE COVERED WITH EIGHT PASSES OF A FORMVAR-TYPE ENAMEL. The first two passes on the wire were made with blank dies which leave only a thin film of enamel on the wire which is not visible on the photograph. The third layer, counting from the wire, disappears for a short space; but the area is filled by succeeding layers.

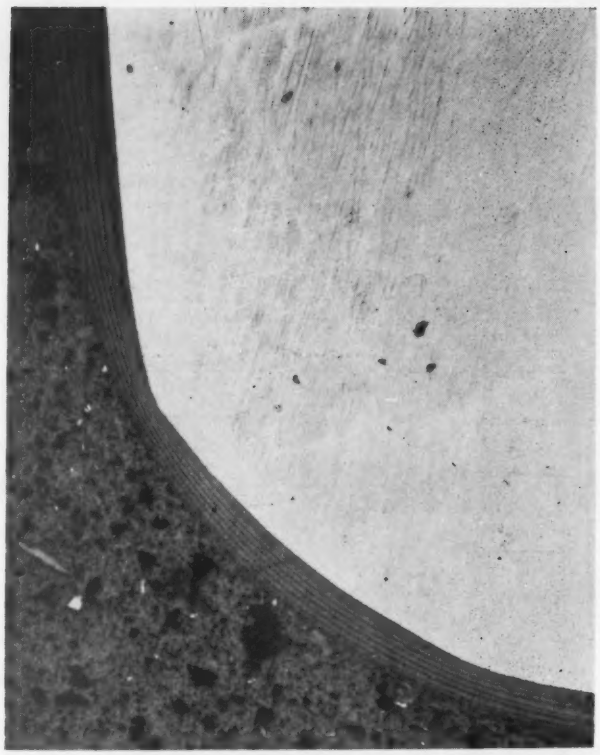


Fig. 1B (right) A CORNER OF RECTANGULAR WIRE COVERED WITH EIGHT PASSES OF A FORMVAR-TYPE ENAMEL. The contour of the corner is what can be expected during normal production. The coverage obtained in this case is very good. All eight passes are continuous in the area photographed.

same manner as most metallographic specimens. A mount of the cross-section of the sample is made in a suitable material. The black Bakelite mounting powder is used because it is thermosetting

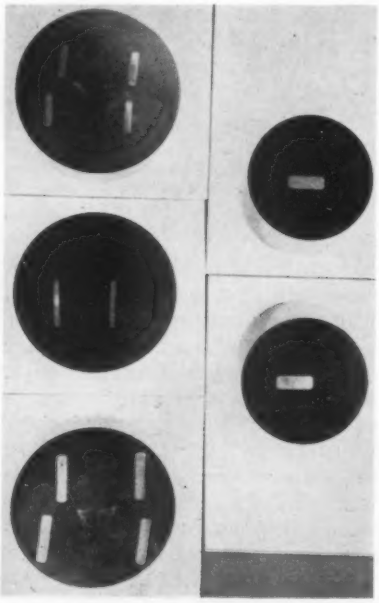


Fig. 3. FIVE OF THE SPECIMENS USED IN DEVELOPING THE ETCHING TECHNIQUE.

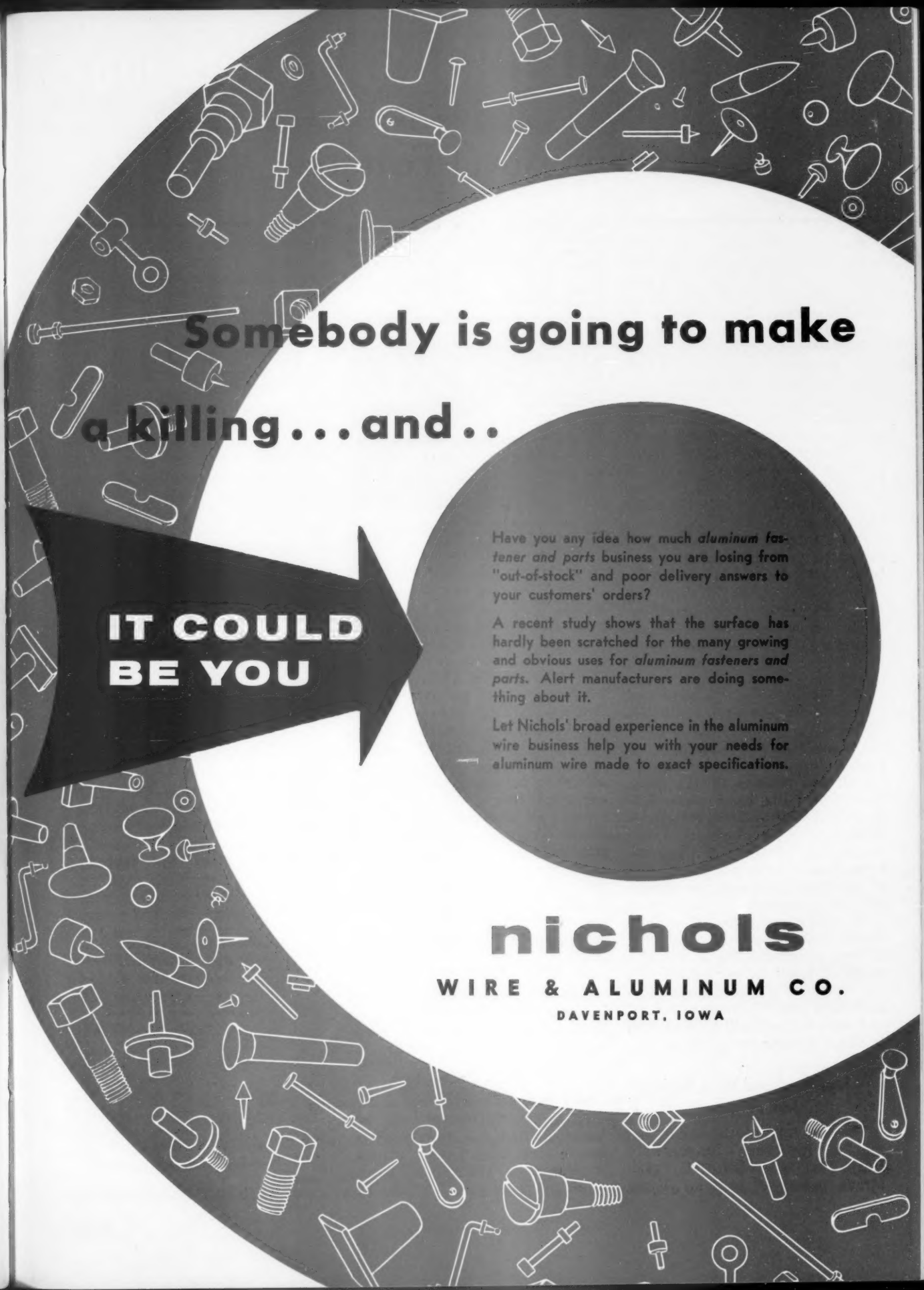
Fig. 2. UPRIGHT CAMERA AND MICROSCOPE USED TO MAKE PHOTOGRAPHS OF THE ETCHED SPECIMENS.

and does not soften or separate from the wire sample during the grinding operations. Another reason for using the Bakelite powder is that it will not react with the etching medium. The specimen is prepared for etching using the following steps:

1. If necessary, the mount is ground on a belt grinder until a full cross section of the wire can be seen and all burrs on the wire have been removed.
2. Grind the mount with dry emery papers starting with No. 3 and using successively finer papers until 4(0) has been used. Since the copper has the lowest grinding rate of any of the materials in the mount, the edges of the copper tend to become rounded during the grinding operation. If the edges

(*Please turn to page* 704)

Fig. 4. POLISHING TABLE USED IN PREPARATION OF SPECIMEN.



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IT COULD BE YOU

Have you any idea how much *aluminum fastener and parts* business you are losing from "out-of-stock" and poor delivery answers to your customers' orders?

A recent study shows that the surface has hardly been scratched for the many growing and obvious uses for *aluminum fasteners and parts*. Alert manufacturers are doing something about it.

Let Nichols' broad experience in the aluminum wire business help you with your needs for aluminum wire made to exact specifications.

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WIRE & ALUMINUM CO.

DAVENPORT, IOWA

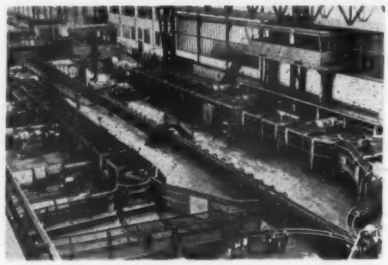
New Rod Mill in Germany Embodies Many Novel Features

Wire rod mills have been evolving rapidly in the last decade toward automation. The description of this German mill, prepared for Wire and Wire Products by a European correspondent, describes equipment that is noteworthy for its novel features.

On the European Continent many designs of new wire rod mills show clearly that steel rolling operations have reached a transition stage. Larger and faster mills have been developed, using elaborate and highly accurate automatic control systems. Not only does the modern mill have to be bigger dimensionally to tackle larger ingots, but also it must be more powerful and faster to reduce the greater cross section of 30 and 40 ton ingots to normal bloom and slab sizes. This has to be performed in roughly the same time as its smaller predecessors rolled a smaller ingot. Preset programmes, translator controls and punched card systems are beginning to be accepted by operators and mill management as prerequisites to full automation. Modern sequence - control systems come into use whereby the system of regulation relies upon information being fed to it to tell when and how to start the next operation. Measuring instruments deal with process variables such as temperature, thickness, diameter, length and position of the piece. Finishing mills have come into operation which would have been thought impossible before the war. In the case of wire rod where the cross section is very small, speeds of 6,000 or 7,000 feet per minute are in operation. A well-known new continuous wire rod mill in Great Britain produces more than 30 tons per hour of ¼ in. rod at a speed of 6,000 ft. per minute. As an example of developments in Europe a new German merchant and wire rod mill will be described in the following paragraphs.

Merchant and Wire Rod Mill Haspe

The new fully continuous rolling mill of Kloeckner - Huettenwerk Haspe AG is designed for two-strand rolling of bars up to the bigger dimensions, and for four-strand rolling of wire rod at the highest speeds possible today. One year after breaking ground, the merchant mill was put into operation in 1955, with the wire rod mill following in 1956. The experience so far obtained shows that specifications have been fully met both from the points of rolling technique and of quality. Production figures show a favourable ratio between the number of operators employed and the amount of electrical energy consumed. The main characteristic of this mill lies in the fact that, in addition to the wide-range program, it is possible to obtain great lengths of bars at close tolerances and the highest coil weights so far produced in Europe.



The four groups in the rod finishing train. Center: 2-strand roller table to the cooling bed. Below: 2-strand S-guides. Upper left: Control platform for reel installation.

* * *

The wire rod mill at Haspe went in operation in July 1956. Data on the main plant are given in Table A.

Main Plant Description

The furnace section contains a furnace for 70 metric tons per hour; depiler for billets of 30 metric tons; billet pusher, ejector. A drum-type switch and tilting pinch roll is set for 4 strands. The roughing train uses D. C. motors of 3,300 H.P. total power, speeds 180 to 1,080 r.p.m. Stands No. 1-8 compose the roughing train (Fig. 1).

* * *

The intermediate train uses 4,500 H.P. D.C. motors at speeds 180 to 900 r.p.m and consists of stands No. 9 to 14. The Bar finishing train employs total 7,000 H.P. motors at speeds 180-1,080 r.p.m. and embraces stands No. 15 to 20. Table B gives details of the 4 groups of the Wire rod and finishing train. In the wire rod section 14 rotating shears, 1 swinging shear, 5 snip shears are employed. Beyond roll stands 1, 3 and 5 are located 3 twisting stands, and 6 pinch roll sets are used. A roller type cooling bed for 2 strands, area 28 x 360 ft. is operated, and a down cutting cold shear exerts a shear pressure of 500 metric tons at a blade length of 3¼ feet. Twelve reels for coils of 200 lbs. and 970 lbs. are used, and also 4 pouring reels and 8 laying reels. 2 transverse conveyor bands and 1 longitudinal band operate within the reel installation. 1 plate conveyor transports material from the reels to the hook conveyor. 7 travelling cranes are installed,

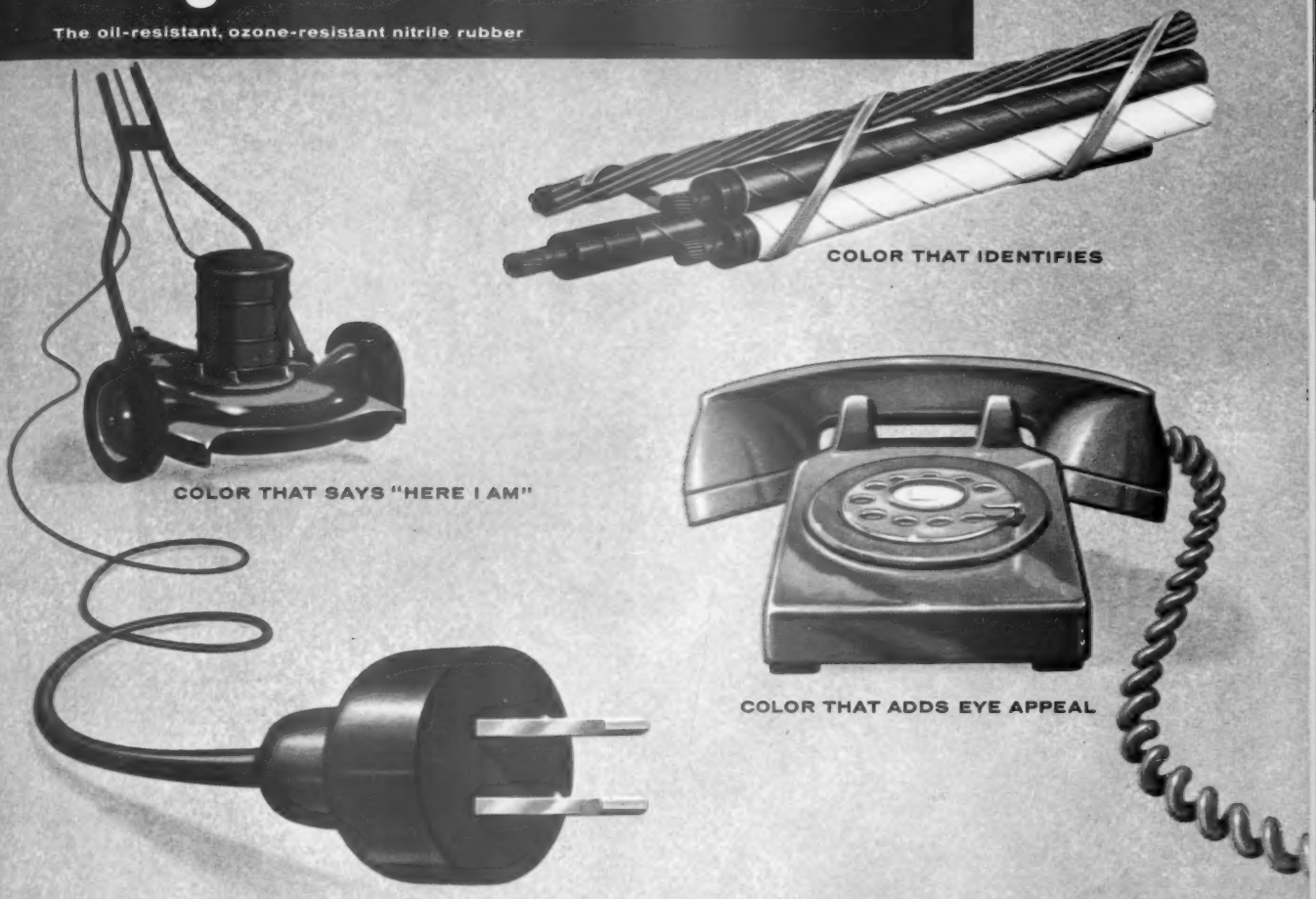
TABLE A

Technical Data

Length of mill		..... 1,100 ft.
Initial Material	(section	..... 2-3/8 and 3-1/8 in.
	(length	..... 30 ft.
	(weight	..... 570 and 1,020 lbs.
Bars	(delivery speed	.. up to 2,400 ft/min.
	(rolling method	.. one or two-strand to roller-type cooling bed.
	(length	..... up to 100 ft.
	(thickness	..... 5/16 to 1-3/8 in. dia. and corresponding sections.
Wire Rod and Rounds	(delivery speed	.. up to 6,000 ft/min.
	(rolling method	.. (two-strand to pouring reels. (four-strand to laying reels.
	(coil weight	..... up to 970 lbs.
	(thickness	..... from No. 5 dia. upwards
Production (with widely varying program)		Up to 25,000 m.tons/month

Naugatuck PARACRIL OZO

The oil-resistant, ozone-resistant nitrile rubber



Now! lasting COLORS in rubber wire jackets

A development of Naugatuck research makes it possible to combine in a vulcanized rubber wire jacket all these properties:

- Excellent resistance to ozone and outdoor "weathering"
- Outstanding heat resistance
- High abrasion resistance
- Excellent oil, grease and chemical resistance
- Fast CV extrusion

...**PLUS PERMANENT BRIGHT COLORS**,

In addition to the suggested uses, you will think of dozens of other applications where wire jacketing with all these properties can serve either an aesthetic or utilitarian purpose.

One of Naugatuck's technical representatives will be happy to discuss with any prospective user the formulation of the Paracril® Ozo compound which makes possible this combination of properties... not only in wire jacketing but also in shoe soles, hose jackets, weather stripping and other vulcanized rubber products.

Naugatuck Chemical

Division of United States Rubber Company

641 P Elm Street
Naugatuck, Connecticut

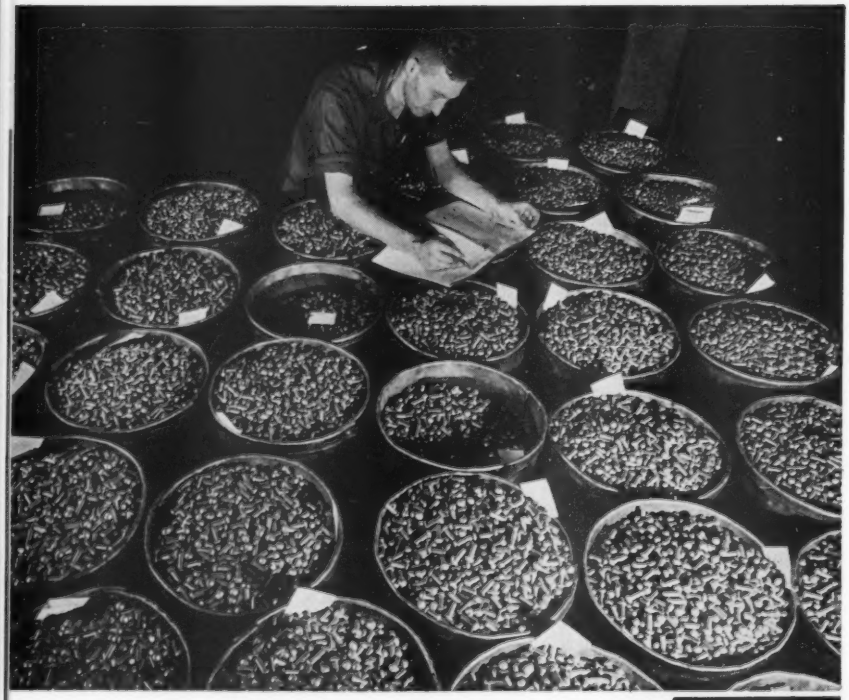
US RUBBER

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario • CABLE: Rubexport, N.Y.

Thousands of rivets or blanks for cold headed Brainard Specials are produced in only minutes (3½ million pieces daily) on this battery of modern cold headers from Youngstown Rivet Quality Wire.

Accent on excellence

Youngstown solid rivet wire



Brainard Rivet Company of Girard, Ohio, daily produces rivets "by the millions". But they realize a rivet is only a rivet—so quality and fast, dependable service are the products they're really selling.

To help in maintaining Brainard's high product quality on a steady, dependable production basis is Youngstown's Solid Rivet Quality Wire. It is free of all injurious seams and inclusions which guarantees long, trouble-free production runs on Brainard's cold headers.

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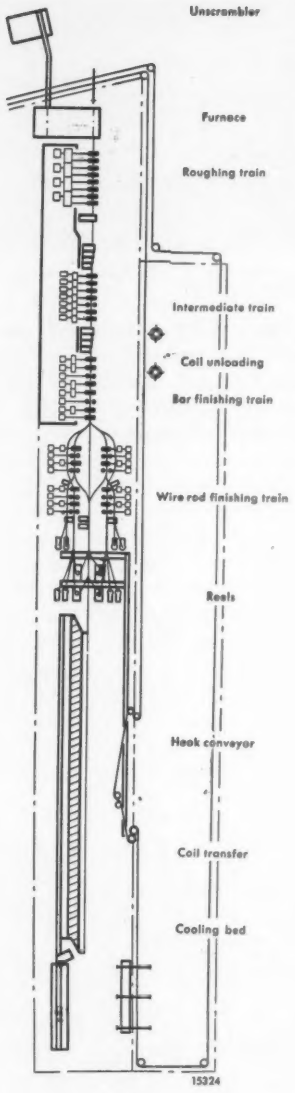

Fig. 1—General layout. Scale: 1 to 1,500. * *

TABLE I

Wire Rod Finishing Train (4 groups)		DC motors	total power 4 X 1,600 HP speeds 490 to 1,860 rpm.
Stand No. 21	11 in. dia.	Upper roll on each side separately vertically and axially adjustable. Roller bearings. Stand can be shifted over the length of the roll barrels.	
Vertical Stand No. 22	11 in. dia.	Front roll on each side separately horizontally and axially adjustable. Roller bearings. Stand can be lifted or lowered electrically over the length of the roll barrels.	
Stand No. 23	11 in. dia.	Identical with stand No. 21.	
Vertical Roll Stand No. 24	11 in. dia.	Identical with stand No. 22.	

capacity each 15 to 20 metric tons.

Wire Rod Finishing Mill

When rolling onto reels, the material leaves the bar finishing mill through two double S—guides for the wire rod finishing mill. (Fig.2). The size of the loops is controlled from the pulpit. In the four finishing groups—one for each strand—there are horizontal and vertical roll stands which are screened by wire mesh for protection from any material running astray. Pass reductions in the finishing groups average between 12 and 16 per cent, the speed for the smallest gauges being up to 6,000 ft/min. (Figs. 2A & 2B).

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Loop lifters take up the loops formed during tension-free rolling and support them. The movement of the loop lifter arm is transferred on to a device which regulates the drive of the following stand so that the loop becomes neither too big nor too small. The current surge occurring in each drive motor, when entering the material, actuates the loop lifter in front of the stand. The return impulse is given by a photo-electric cell in the range of the S-guide.

Fig. 2—General view of 2-strand merchant mill to cooling bed, looking toward furnace. * *

The tolerances of the finished wire rod depend greatly on the reliable operation of the loop lifter, on its flexible, almost pressureless support of the material, and on the exact adjustment of the loops within given limits. (Fig. 3).

★ ★ ★

The material leaving the finishing groups at high speed, can be subdivided beyond them by rotating shears, so that coil weights between 200 and 970 lbs. are possible.

★ ★ ★

Before following the material to the reels, here is an example of how quickly the mill deals with trouble, if, for instance, it develops with strand No. 1. The moment this occurs, the snip shear in front of wire rod finishing group 1 cuts the strand. The following material would now run up into the loop cage and form a ball which would be difficult to disentangle, were it not simultaneously cut into short lengths by the rotating shears in the intermediate train. As it is, only the material which is already in the bar finishing train can run into the loop cage. As soon as the

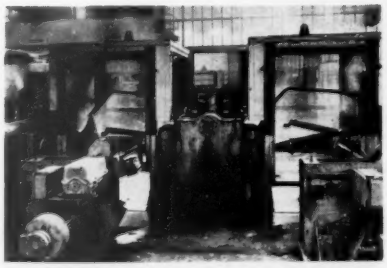

Fig. 2A—Automatic loop lifters in rod finishing train. In foreground tubular guide to laying reels with finished rolled rod. * * * *

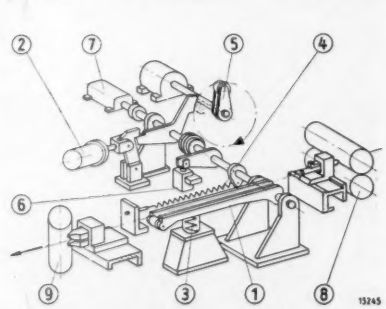

Fig. 2B—Drawing of loop lifter for rod mill: 1. loop lifter arm; 2. release; 3. acceleration spring; 4. holding spring; 5. return device; 6. hydraulic damper; 7. electric transmitter for speed control of the following stand; 8. horizontal roll stand; 9. vertical roll stand. * * *

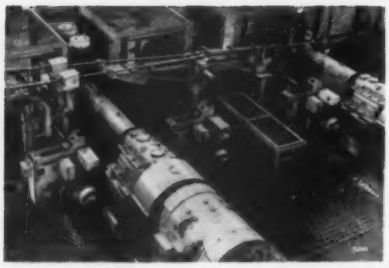

Fig. 3—Automatic switch in tubular guide leading to laying reels.

cage has been cleared, strand 1 can be rolled again. This prompt manner of dealing with trouble is important, especially when running-in the mill.

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Beyond the finishing groups, the wire rod is conveyed over automatic switches through tube guides to the reel installation.

Reel Operation

There are two reels for each strand which are fed alternately. Reel speed is automatically regulated according to the speed of the last stand.

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The baskets of the laying reels can be easily exchanged, permitting reeling different sizes of coil at speeds between 2,067 and 6,000 ft/min. The windings are well arranged. Through a contact tube, the tail end of the wire rod initiates the lowering of the reel basket

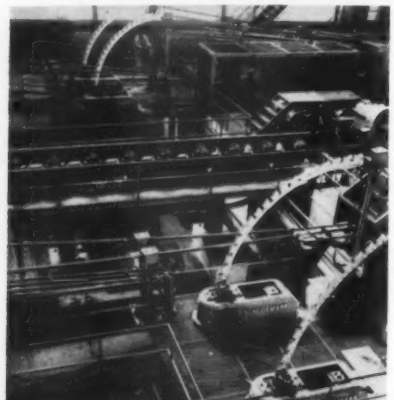

Fig. 4—Delivery from rod finishing train to the 4 laying reels in front of control platform.

and the pushing off of the coil. (Fig. 4).

★ ★ ★

Material which is too stiff for the laying reel or where twisting is not desired is coiled on pouring reels. Their baskets can also be exchanged for different coil sizes. These reels serve mainly for coiling material leaving the bar mill. In the range of the rotating cooling bed shears, the two strands are led under the floor and sent by pinch roll sets into the reels. Coiling speed is between 886 and 3,150 ft./min. The pouring reels are so located that they can also take material from the two last wire rod finishing groups. (Fig. 5).

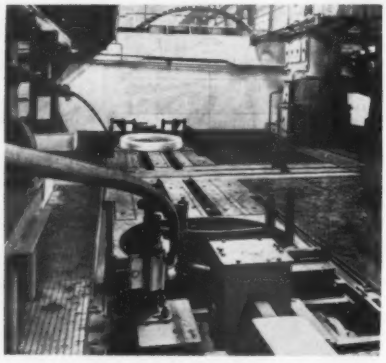

Fig. 5—Pouring reel ready to receive rod in foreground. Lifted coil ready to be pushed off in background.

The coils, which have a heat of 1,400 to 1,670°F, are pushed from the laying or pouring reels on to intermediate plates. As soon as the transverse conveyor is free, the coil is pushed on to it by mechanical fingers. Transfer of the coils from the intermediate plates to the conveyors as well as transfer from one conveyor to the next is effected without shock. All these operations are automatically controlled so that in normal service each pair of fingers of the conveyors is in operation.

Coil Transport Operation

The coils are taken from the reels to the hook conveyor by a plate conveyor, the latter being so designed that it will not twist under the influence of the hot coils. (Fig. 6). These lie centrically over recesses in the plate conveyor. At the transfer point the hooks of the hook conveyor enter

Fig. 6—Transport from laying and pouring reels to plate conveyor.

at the side and take off the coils with a uniform motion, allowing them to hand parallel to the direction of movement. This is of advantage compared with transverse hanging, as hall space is better utilized and bundling is more simple. The last turns of the windings, which were on top when coiling, are now on the free side of the hook, thus facilitating control. From the reels to the hook conveyor, a distance of about 330 feet, the coils are so gently handled that no deformation occurs. By the time they are lifted into a hanging position they are sufficiently cool to retain their round shape. (Fig. 7).

Fig. 7—Transfer of coils from plate conveyor to hook conveyor system. Wire ends at top of coils.

On the hook conveyor, which is 4,100 feet long, the coils continue to cool, are bundled on the way and receive control tags. The speed of the hook conveyor can be adapted to production requirements. As the conveyors in the reel plant, the plate conveyor leading to the hook conveyor, and the hook conveyor itself are driven by

a single motor, the coils proceed evenly from the reels to the unloading point. The cold coils can be taken down either in the pickling hall or in the finishing hall. At each point, there are two automatically controlled unloaders and two collecting turnstiles. The taking-down of the coils is controlled by contacts which are operated only by the loaded hooks. The unloader transfers the coils to one of the four arms of the collecting turnstile, each arm being capable of taking 2.2 m. tons. When an arm is loaded, the turnstile is rotated through 90 degrees. During this action, the loaded arm is lowered on to the scales and the next free arm moves into the receiving position. The coils are weighed while still on the turnstile arm and are then carried to the stockyard by crane or loaded on to a truck or a railway car. (Fig. 8).

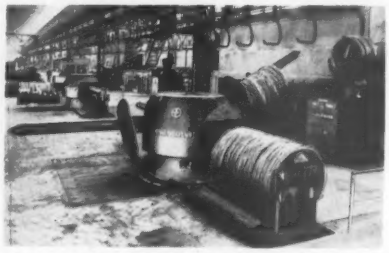

Fig. 8—Automatic coil unloaders with collecting turnstiles in finishing end of building.

Electrical Equipment

Initial power for the whole plant is 10 KV and there are three cables with a maximum capacity of 17,000 KVA which can be switched to its own or outside supply at the power station which is situated about a mile away. A dual bus bar system of the high tension equipment permits the rolling mill to be supplied simultaneously with both its own and outside current.

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All main drives of the mill are DC motors which are fed by rectifiers and regulated electronically. This allows the wide speed range required for a continuous merchant and wire rod mill, so that speeds can be adapted to the sections to be rolled. It also ensures high efficiency when converting three-phase current into DC, and permits quick automatic speed

TABLE C

Total installed motor capacity (without roller table motors)	27,000 HP
of which for main drives 35 motors having in all	21,400 HP
of which for auxiliary drives 47 DC motors having in all	2,000 HP
173 three-phase motors in all	3,800 HP
motors for ventilation, colling and transforming are not included.	
Total length of cables including control lines	370 miles.
Rectifiers without pumps for DC fed main drives	30.
Transformers for main and auxiliary drives	16
High-tension cubicles (Dual bus bar system)	34.
2 condenser sets to improve the power factor	2,000 reactive power KVA.
Electronic regulators which limit the dynamic speed loss and adjust it to within ± 0.2 per cent.	
merchant bar mill (dynamic speed loss	max. 1.5 per cent.
(recovery time	0.15 s.
Wire Rod finishing mill (dynamic speed loss	max. 1.0 per cent.
(recovery time	0.1 s.

regulation. Each mill motor in the static state thus keeps a pre-set speed within ± 0.2 per cent of the final value, independent of charge, tension fed, field heating and other factors of influence. In case of sudden surges with nominal moment at base speed the dynamic speed difference is not more than 1.5 per cent of the final value; recovery time is 0.15 seconds.

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This regulation, in connection with proper furnace operation forms the basis for the continuous rolling at high speeds and low tolerances. Furthermore, provision has been made that the desired speed can be set to 0.1 per cent of the final value. This greatly facilitates operating the mill, especially when changing the programme. The so-called sequence control serves the same purpose. If, for example, the speed of a mill motor is changed by means of the sequence switch, the speeds of all following mill motors are changed accordingly. This saves protracted setting and resetting of the individual motors. The sequence control covers the whole mill. If, therefore, the speed of mill motor No. 10 is modified, the speeds of motors Nos. 10 to 24 are modified simultaneously.

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For one-strand finish-rolling there are loop lifters which permit tension-free rolling with visible loop between two stands. As continuous rolling without repeaters permits only very small loops, a loop lifter control is required. The size of the loop, which is automatically measured by the lifter, influences the speed of the following mill motor so that the loop becomes neither too big nor too small. Release and return of the loop lifter are initiated by the material itself. The operators need not intervene. (Fig. 9).

Fig. 9—Control cabin for intermediate section.

Auxiliary drives, too, as far as is necessary and suitable, are automatically actuated and regulated. The knives of the rotating shears operate synchronously with the material to be cut. Cropping is initiated by the material. Cropping length can be regulated from the control stand by means of electronic time relays. The reels and the approach table of the cooling bed are controlled by regulators to correspond with the speed of the last stand. The billet entering the mill becomes a coil without intervention by hand being necessary. The same applies to the rolling on to the cooling bed. Here, too, no manual work is needed until the material lies in cooling bed lengths on the runout roller table. The work of the operators is confined in both cases to adjustments.

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It is characteristic of this type of continuous mill that fewer personnel are necessary compared with the older type of open mills. This automation naturally requires more machinery and electrical equipment.

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Most of the electrical equipment is telecontrolled. A great number of measuring and signal devices are installed. The control plat-

(*Please turn to page* 705)

Announcing the . . .

ANNUAL CONVENTION

OF

THE WIRE ASSOCIATION

The Dates: **October 13—16, 1958**

The Place: **Chalfonte - Hadden Hall Hotel, Atlantic City, N. J.**

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Salesville Heights
Lincoln, R. I.

The Program

For the Ferrous Division, seventeen technical papers have been secured, covering various phases of steel wire processing and manufacturing operations.

The Non-Ferrous Division presently has concluded arrangements for sixteen papers covering production problems in connection with bare and insulated power conductors and communication wire and cable. This will include many more papers of interest to electric wire and cable men than have been presented at any previous convention.

Plant visits to Roebling's steel wire plant in Roebling, N. J., and to Roebling's electric wire and cable plants in Trenton, N. J.

Many other program features will make the 1958 Convention the most important one yet held. Full details will be published at a later date.

Meanwhile, make your plans to attend.

THE WIRE ASSOCIATION

RICHARD E. BROWN, *Executive Secretary*

453 MAIN STREET **STAMFORD, CONN.**

Foamed Polyethylene Coaxial Cables

by

C. C. Camillo and G. R. Karlson

Amphenol Electronics Corporation

Chicago, Illinois

This paper was delivered by Mr. Camillo, Engineering Manager of the Cable and Wire Division, at the Signal Corps Wire and Cable Symposium at Asbury Park, N. J., on December 3, 1957.

I. Introduction

In the field of coaxial cable development, there has always existed a strong demand for new designs of lower electrical losses and lighter weight. The introduction of "foamed" or cellular polyethylene several years ago provided a material with very promising possibilities regarding reduction of electrical losses and weight. However, because of this cellular construction of the dielectric, it was apparent that the possibility of moisture penetration, and the resultant degradation of electrical performance would be a question requiring serious analysis.

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The purpose of this investigation, therefore, was to study in detail the mechanism and effects of moisture penetration on cellular dielectrics under both laboratory controlled and natural environmental conditions. Of particular interest was the determination of these effects on actual coaxial cables constructed with cellular dielectrics in contrast to the possibility of performing measurements on the dielectric material alone as evidenced in Reference 1. This method of evaluation was chosen since it was felt that the resultant data would be much more elucidating if presented in terms of coaxial cable parameters.

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Both laboratory controlled and natural environmental heat and humidity tests were conducted in the hope of correlating the laboratory conditions in more specific terms of actual time of natural exposure. The natural exposure tests, though still in progress, have yielded sufficient data for presentation at this time.

II. Construction of Samples

In using a dielectric with a permittivity between that of air and solid polyethylene, one cannot design a true "equivalent" to any of the solid dielectric cables in present usage since this change in permittivity results in a new ratio of conductors for a given characteristic impedance value. Thus, if the center conductor diameters of the cables are set in equality, then the outer conductor diameters are very much different and conversely if the outer conductor diameters are equal, the center conductor diameters will differ. From this condition, it naturally follows that it might be possible to construct cellular dielectric cables such that several electrical parameters might be the same as those of a solid dielectric cable of dissimilar size.

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Thus, there are several different approaches which can be followed in constructing and comparing cellular dielectric cables with solid dielectric cables, and care must be exercised in performing the comparison to prevent erroneous conclusions. Regardless of these pitfalls of comparison, some frame of reference was necessary to evaluate the performance of the new cable designs and the following criteria were chosen:

1. The characteristic impedance of the cables being compared must be identical.
2. The physical size in terms of the overall diameter should be the same.

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These design conditions were selected on the basis that while the size, weight, and handling characteristics of the cellular dielectric cables would be very similar to the solid polyethylene cable, the electrical performance should be far superior. Further, since the RG-11/U represents one of the most popular types of cables being manufactured, this size was selected for the evaluation project.

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Figure 1 illustrates both the solid and cellular dielectric RG-11/U cable constructions and also presents all the important dimensions of each cable, while Table I and Figure 2 show the results of actual measurements on both types. This data is actually the average of measurements performed on many samples of each type.

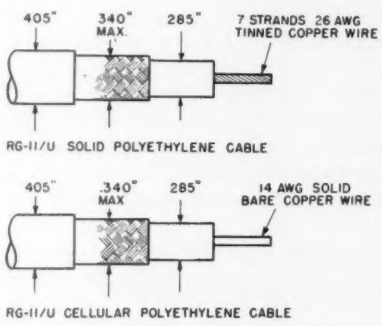

FIGURE 1
CELLULAR AND SOLID DIELECTRIC CABLES

Although this is the only size cable which was completely evaluated with regard to humidity effects, cellular dielectric cables ranging in size from RG-59/U to RG-35/U have been successfully fabricated. The construction of cables larger than RG-35/U and smaller than RG-59/U represents no particular problems aside from the availability of proper extrusion equipment.

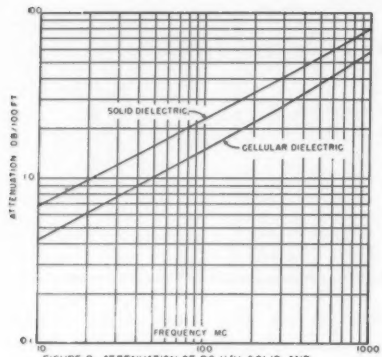

FIGURE 2 ATTENUATION OF RG-11/U SOLID AND CELLULAR DIELECTRIC CABLES

TABLE I

ELECTRICAL & PHYSICAL DATA FOR SOLID & CELLULAR DIELECTRIC RG-11/U SIZE CABLES

	CELLULAR	SOLID
Capacitance - mmfd/ft	17.3	20.5
Velocity Ratio - %	82	65.9
Impedance - Ohms	75	75
Corona - VRMS	3300	5000
Weight - lbs/M ft	112	97
Attenuation - db/100 ft		
10 mc	0.42	0.66
50 mc	1.00	1.60
100 mc	1.45	2.25
150 mc	1.82	2.85
200 mc	2.15	3.30
400 mc	3.20	4.75
1000 mc	5.70	7.90

In general, it can be said that the data shown in Table I and Figure 2 is in good agreement with qualitative expectations. Attenuation was reduced by approximately 33 per cent and capacitance by 15 per cent. The weight increased by 15 per cent despite the lower density of the cellular polyethylene because of the larger sized copper center conductor. The lower corona voltage is to be expected with cellular dielectrics and does not present any difficulty except in high power pulse applications.

III. Natural and Artificial Environmental Evaluation

Naturally, with the use of any semi-solid and cellular dielectrics the problem of moisture penetration or absorption and its resulting effects must be investigated. In this case, tests were first conducted by measuring cable attenuation before and after subjecting to a standard humidity cabinet cycle. The drawback resulting from this approach is that this type of data cannot be correlated to practical usage figures in terms of hours, months or years exposure to the elements. Thus, to supplement this data, a 750 foot pole line was set up and sample cables were lashed to messenger wires for natural environmental aging in the elements.

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The humidity chamber tests were carried out as outlined in MIL-STD-202, Method 106. Prior to the test, the cables were allowed to condition at 25 degrees Centigrade and 50 per cent relative humidity (RH) until stabilized. The cables were then placed in the humidity chamber and the environment changed to 65 degrees Centigrade at 90 to 95 per cent RH within 2-½ hours. The environment remained the same for three hours after which the temperature was reduced to 25 degrees Centigrade in 2-½ hours at the same RH. The temperature was then increased to 65 degrees Centigrade at 95 per cent RH within 2-½ hours completing a full cycle. Ten complete cycles constituted a full test.

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Although it was realized that this test would be considerably more severe in its effects than any natural environment, it was selected for three specific reasons. First, the equipment was readily available and tests could be conducted without great delay. Second, it was felt that the resulting data should be repeatable and, therefore, good comparisons between various samples could be obtained. Third, the dependance upon osmotic pressure only: that is, high humidity at a fixed temperature would have been a slower, more time-consuming test.

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The cable attenuation test was chosen as the most sensitive test to determine the effects of this humidity cycle upon the cellular dielectric cables. Capacitance and velocity ratio measurements performed before and after the humidity test showed no perceptible change within experimental errors, and corona measurements were too variable from sample to sample to detect fine changes. Moreover, since the real motivation in utilizing cellular dielectrics in high frequency coaxial cables is the reduction of attenuation by a large factor, this should be the parameter under investigation.

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In all cases, the attenuation was measured both before and after the standard ten cycle humidity test. The RG-11/U equivalent cable described above was utilized throughout the evaluation although some tests were conducted with an RG-59/U equivalent cable using foamed polyethylene and similar results were obtained.

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Each sample was fifty feet in length and for simplicity and rapidity, the Boonton RX meter was used to measure the attenuation at frequencies between 10 and 250 mc by the resonant length method which is fully covered in the instruction book. However, the simplifying assumption that tanh (al) = al can only be used for very short samples and, therefore, the exact equation was used in all computations.

★ ★ ★

In the first exploratory test, samples of the cellular dielectric RG-11/U and RG-59/U cables were evaluated in comparison to the solid dielectric RG-11/U and RG-59/U cables with the only protection over the cut ends being one wrap of pressure sensitive tape in accordance with the practices set forth in MIL-C-17B for storing coaxial cables. The results of the tests shown in Figures 3 and 4 indicate that the attenuation of the cellular dielectric RG-11/U cable increased by 25 per cent at frequencies below 50 mc, while at 250 mc the attenuation increased from 2.40 db/100 feet to 3.65 db/100 feet. This is

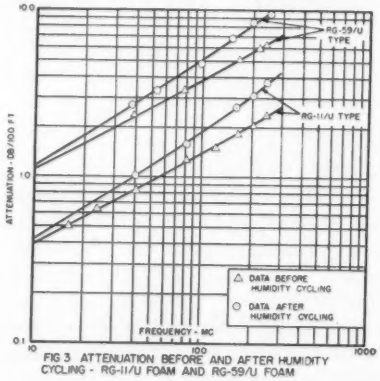

FIG 3 ATTENUATION BEFORE AND AFTER HUMIDITY CYCLING - RG-11/U FOAM AND RG-59/U FOAM

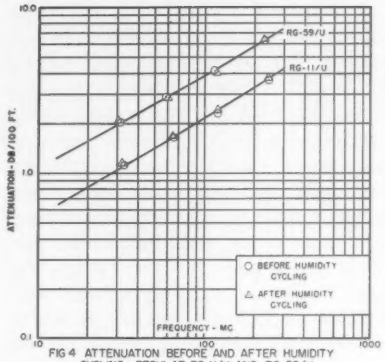

FIG 4 ATTENUATION BEFORE AND AFTER HUMIDITY CYCLING - REGULAR RG-11/U AND RG-59/U

a change of 1.25 db/100 feet or a 52 per cent gain. The RG-59/U cellular dielectric cable exhibited an almost identical percentage increase of attenuation at all frequencies in the range of measurement. In comparison, the solid polyethylene cables showed no measurable change in attenuation throughout the frequency range under consideration.

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It was originally felt that there were possibly several factors to which these results could be attributed. One of these was that the ends of the cable, being protected only by a single wrap of pressure sensitive tape, were absorbing moisture that followed the braid by capillary action and entered the cellular dielectric.

★ ★ ★

In addition, it was thought that jacket plasticizers or the residue left by the foaming agent might have contaminated the dielectric during this test since the cable is subjected to temperatures of 65 degrees Centigrade for extended periods. The possibility of jacket plasticizers contaminating the cellular dielectric was ruled out because of the results on the RG-59/U cable which utilized a black polyethylene jacket containing no jacket plasticizers and also because of the results obtained on the solid dielectric RG-11/U cable.

★ ★ ★

Whether or not the residue of the foaming agent caused contamination was never positively established as indicated by the erratic nature of the data obtained in Table II. In these experiments, attenuation measurements were

TABLE II

HEAT AGING RESULTS

CELLULAR DIELECTRIC CABLES

	DB/100 FT @ 3000 mc		
RG-59/U TYPE*	BEFORE	AFTER	Δ DB
Sample #1 - Non-Contaminating Polyvinyl Chloride Jacket	26.9	26.3	-.06
Sample #2 - Polyethylene Jacket	26.1	22.2	-3.9
Sample #3 - Polyethylene Jacket	26.7	29.8	+3.10
RG-11/U TYPE*			
Sample #1 - No Jacket On Cable	10.5	10.9	+.04
RG-59/U TYPE**			
Sample #1	26.7	26.5	-.02

*Aged 7 days at 98 degrees Centigrade

**Aged 4 days at 98 degrees Centigrade

performed on various samples of cellular dielectric cables before and after heat aging at 98 degrees Centigrade. However, the actual magnitudes of the changes, shown in Table II, which occurred at 3000 mc could hardly result in the changes encountered at 200 mc if smooth extrapolations of the graphs of Figure 3 are assumed, since values of +8 db to +10 db change in attenuation at 3000 mc would be expected on this basis.

★ ★ ★

Moisture penetration of the cable jacket, acting as a permeable membrane was definitely considered as one of the contributing factors; however, before any conclusions could be formulated, it was necessary to investigate the hypothesis that moisture penetrated the cable ends. This was done by humidity testing an additional number of RG-11/U cellular dielectric cable samples with various schemes for sealing the ends. In all, five schemes were devised as follows:

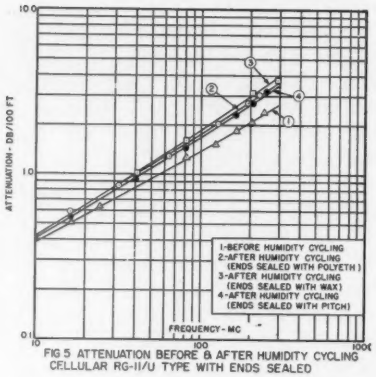
1. **Seal ends by dipping in transformer pitch.**
2. **Seal ends by wrapping in wax paper and covering with molten wax.**
3. **Seal ends by dipping in molten polyethylene.**
4. **Seal ends with capped type N connectors.**
5. **Seal ends with capped, improved type N connectors.**

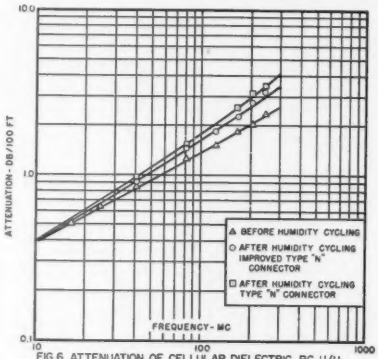
★ ★ ★

The results of all of the tests are given in Figures 5 and 6. Figure 5 shows the results of the first three methods of sealing, while Figure 6 illustrates the effectiveness of type N connectors in sealing the cable ends.

★ ★ ★

These two graphs show that the


ATTENUATION - DB/100 FT
FREQUENCY - MC
1-BEFORE HUMIDITY CYCLING
2-AFTER HUMIDITY CYCLING (ENDS SEALED WITH POLYETH.)
3-AFTER HUMIDITY CYCLING (ENDS SEALED WITH WAX)
4-AFTER HUMIDITY CYCLING (ENDS SEALED WITH PITCH)
FIG 5 ATTENUATION BEFORE & AFTER HUMIDITY CYCLING CELLULAR RG-11/U TYPE WITH ENDS SEALED


ATTENUATION - DB/100 FT
FREQUENCY - MC
△ BEFORE HUMIDITY CYCLING
○ AFTER HUMIDITY CYCLING IMPROVED TYPE 'N' CONNECTOR
□ AFTER HUMIDITY CYCLING TYPE 'N' CONNECTOR
FIG.6 ATTENUATION OF CELLULAR DIELECTRIC RG-11/U CABLE WITH CAPPED CONNECTORS

method of treating the cable ends has a marked effect on the behavior of the cable in humidity cycling tests. However, the most waterproof and moisture proof methods could not eliminate the condition entirely and, therefore, the remainder must be due to moisture permeability of the jackets.

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Varenelli's paper on this subject points out that polyethylene is less permeable than vinyl by a factor of 100 to 1; and if utilized as a cable jacket, it should result in less attenuation change for any given test. If the test is sufficiently lengthened, equilibrium with the environment will eventually be reached and both cables will exhibit the same attenuation increase. Moreover, if the humidity outside the cable is less than the humidity inside the cable, then moisture will leave the cable by the same process as it entered until equilibrium is again attained. These statements were experimentally verified by a series of four tests.

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First of all, RG-11/U cellular

dielectric cables were constructed with both vinyl and polyethylene jackets and subjected to the standard humidity cycle. The resulting data shown in Figure 7 illustrates that both cables have in fact reached equilibrium since there is no difference in the attenuation curves. A second test was conducted by exposing fifty foot samples of both cable types to the elements for 30 days. The data is given in Figure 8 where it can be seen that the attenuation of the polyethylene jacketed cable remained unchanged while the vinyl jacketed cable showed a definite increase.

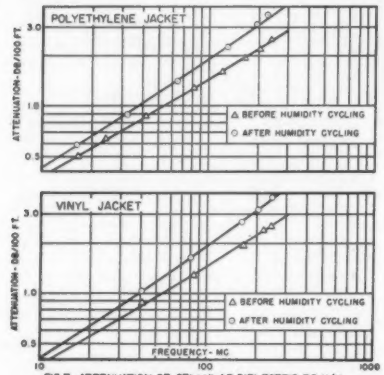

FIG.7 ATTENUATION OF CELLULAR DIELECTRIC RG-11/U TYPE POLYETHYLENE AND VINYL JACKETS

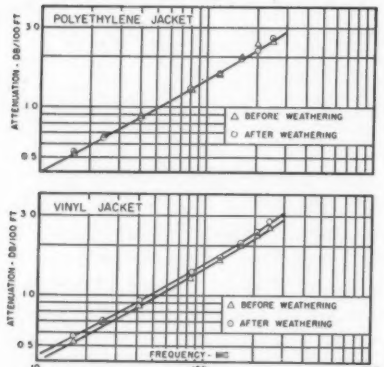

FIG 8 ATTENUATION OF CELLULAR DIELECTRIC RG-11/U CABLE BEFORE AND AFTER 30 DAYS OUT-OF-DOORS

In the third test a sample of vinyl jacketed cable was subjected to the standard humidity cycle and the attenuation was measured directly afterwards and at two-day intervals thereafter. The attenuation remained fairly constant for several days after the test, then it decreased rapidly to a stabilized value which was still above the original value before the test. No subsequent decrease was obtained. Several graphs have been plotted in Figure 9 from the data which was accumulated.

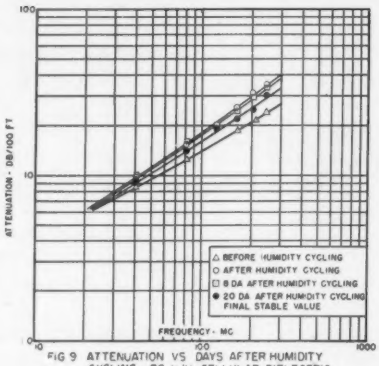

FIG 9 ATTENUATION VS DAYS AFTER HUMIDITY CYCLING - RG-11/U CELLULAR DIELECTRIC

Also, to determine whether or not the ten cycle test was sufficient to bring about complete equilibrium of the cellular dielectric cables with the 95 per cent RH environment, the test was extended for twenty cycles with no change within the experimental error of attenuation measurement.

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Thus, the foregoing experiments have shown that the attenuation of cellular dielectric cables does increase due to the absorption of moisture through the jacket of the cable. Yet in all of those tests, the actual magnitude of the increase has been small. At the maximum frequency considered, of 250 mc, where this increase is the greatest it amounts to only 0.7 db/100 feet if the ends of the cable are properly sealed. Comparison of these values, after humidity cycling, with that of the solid dielectric cables reveals that the cellular dielectric cables is still lower in attenuation than the solid RG-11/U by 0.60 db/100 feet at 250 mc and 0.20 db/100 feet at 10 mc. This represents achieving a condition midway between the attenuation characteristics of the solid dielectric RG-11/U cable and cellular dielectric RG-11/U cable before humidity testing.

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The next question which arises after an evaluation of this type is how realistic are these laboratory tests with regard to the normal environments encountered.

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The only real method by which a coaxial cable or any product can be evaluated is to subject it to the actual usage for which it is intended. In this case, the actual usage of coaxial cables can range from short lengths carrying radio frequencies from one equipment to another in the laboratory to long supported outdoor antenna feed lines in fixed station transmitters, telemetering installations and aircraft applications. Probably the most extreme environmental conditions would be encountered in the unpressurized portions of all weather aircraft, but the unavailability of such test conditions necessitated utilizing the next best method which is that of general outdoor exposure.

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The decision to lash samples of coaxial cables to messenger wires supported by a standard pole line was based on several important factors. In order to provide a system which would be sensitive to small changes in attenuation and relatively free from measurement error, a long length of cable would be necessary. Coiling such a length and hanging it out of doors would not represent a true exposure since many turns of the cable would never be in contact with anything else but the jacket of other turns of this cable. Stretching out the length in a straight course upon the ground presented problems of accidental damage as well as shielding the cable from sudden temperature changes.

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The installation finally selected consisted of setting ten poles averaging 12 feet above the ground at a spacing of 75 feet between poles to give an overall length of span of 750 feet. By running the cable out on one side of each crossarm and back on the other side, a total cable length of 1500 feet was achieved and measurements of attenuation were considerably facilitated by having both cable ends available at the same point. The ends of the cable were fitted with improved type N connectors with caps since the foregoing experiments indicated this treatment was as effective as any tried and would allow rapid measurement without having to provide new end seals.

Besides the RG-11/U size cellular polyethylene, standard RG-11/U, RG-35/U without armor, and cellular dielectric RG-59/U cables were strung on separate messenger wires as part of an overall evaluation program. The installation was completed July 16, 1956 and initial measurements were performed on July 18, 1956.

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Measurements were repeated thereafter at intervals of approximately one month. Since most of the changes measured were so small only the important cases are shown in graphic form in Figure 10. Inclusion of all the date would result in too much confusion.

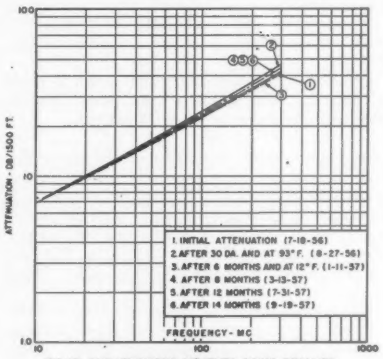

FIG. 10 OUT-OF-DOORS WEATHER AGING RESULTS RG-11/U CELLULAR DIELECTRIC

From the measurements, it appears that the cable attenuation increased to a maximum value after only five weeks exposure and thereafter never exceeded this value. There were subsequent changes wherein the attenuation decreased and increased again but these excursions always remained within the boundaries of the first and second set of measurements.

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The third set of measurements shown were performed in January of 1957 at an ambient temperature of 12 degrees Fahrenheit, and it is felt that the decrease in attenuation is due to the lower copper losses at this ambient temperature. This conclusion seems to be supported by the data obtained 3/13/57 and 9/19/57 where the ambient temperature was much closer to that of the original measurement and the second measurement. In addition, the results obtained on the solid dielectric cables show similar decreases of attenuation at the low ambient temperature, however, there is no increase of attenuation of these cables which is attributable to moisture penetration.

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Thus, after fourteen months of exposure to the elements, the attenuation of the cellular dielectric cable has only increased by 5 to 10 per cent over its original value. In terms of decibels per 100 feet, this is 0.02 at 10 mc and 0.267 at 250 mc which is smaller than the humidity cabinet results by a factor of 4.7 to 1. Further, the attenuation values of the cellular dielectric cable at 250 mc after fourteen months of exposure is still 1 db/100 feet less than the solid dielectric RG-11/U cable. This represents a retained improvement of 25 per cent over the solid dielectric cable. In view of the fourteen months of outdoor test results, indications are that the cellular dielectric cable will exhibit no further changes from those in Figure 9 aside from the normal effects due to ambient temperature and humidity changes.

IV. Summary and Conclusions

Coaxial cables using foamed or cellular polyethylene were constructed. One of these cables having the same overall diameter and characteristic impedance as the standard solid dielectric RG-11/U type was investigated in detail. With this size cable, the electrical tests showed attenuation at 250 mc to be 2.4 db/100 feet as compared to 3.7 db/100 feet for the standard RG-11/U cable which represents a 35 per cent reduction, while capacitance was reduced 15 per cent or from 20.5 mmfd/ft in the solid dielectric RG-11/U to 17.5 mmfd/ft in the cellular dielectric cable. Because the cellular dielectric cable was fabricated to have the same overall diameter and characteristic impedance as the solid dielectric cable, it was necessary to utilize a much larger center conductor and consequently the weight of the cellular dielectric cable increased 15 per cent over that of the standard RG-11/U.

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The results of the tests conducted in the humidity chamber have shown that water vapor is capable of penetrating the jacket of the cable, entering the individual cells of the dielectric and increasing the losses of this cable. It was further demonstrated that the means by which the ends of the cable are sealed can affect the magnitude of the attenuation increase by a factor of two to one. With only a single wrap of pressure sensitive tape over the cable ends, the attenuation at 250 mc increased to 3.65 db/100 feet after humidity cycling from its original value of 2.4 db/100 feet. Utilizing capped, improved type N connectors to seal the cable ends resulted in an increase to 3.1 db/100 feet under the same conditions.

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Additional humidity chamber tests illustrated that the use of a cable jacket with a lower rate of moisture permeability would slow the process of moisture penetration. On the other hand, by lengthening the time of exposure to humidity cycling, cable samples with jackets having very small permeability rates exhibited the same characteristics as those cables having a jacket with a moderately high vapor permeability.

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The humidity chamber tests, although valuable in disclosing the effects of humidity on these coaxial cables, could not be interpreted in terms of actual usage conditions. Therefore, in order to establish the practicability of using cellular dielectrics in coaxial cables, it was necessary to obtain data on the electrical performance of these cables by actually exposing long lengths to the elements on an outdoor pole line. After fourteen months of outdoor exposure, during which time temperatures ranged from 0 degrees F. to 95 degrees F. and relative humidity from 20 per cent to 100 per cent, a 1500 foot length of cellular dielectric RG-11/U cable exhibited an attenuation increase of 0.3 db/100 feet as compared to 0.5 db/100 feet obtained after a four

(*Please turn to page* 706)

Questions and Answers

The company making the inquiries stated that they were doing the drawing on a 5-hole slip machine. They felt that their problem was not due to wear, but to particles of wire becoming welded to the entrance angle of the dies.

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Drafts of .195", .167", .137", .115" and .097" were being made. On this the die expert commented that they had a 26½% reduction of area between the 3rd and 4th blocks and 29% between the 4th block and the finish die. This difference in draft down through the machine, he observed, might be the cause of the trouble experienced, unless the machine were specially geared to this type of reduction. Excessive wire slippage on the block will cause an accumulation of slivers in the die and scratching of the wire.

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The specific questions asked and their answers follow.

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Question: When do you use 12°, 16°, 20°, 25°, and 30° entrance angles and why?

Answer: Entrance angle size is determined by several factors.

a. When a light draft is used, tightening up on the angle increases the length of reduction area, thus moving the wear ring farther away from the bearing. Remember, wire drawing is wire stretching. The entrance angle holds the wire until it has stretched small enough to go through the bearing.
A 12° angle is generally used for drawing high carbon spring wire and rope wire when drafts are light, say 20% to 25% reduction of area.

b. The 16° angle is the most universally used angle. Probably 70% of all wire drawn is done on a 16° angle.

c. A 20° angle is used on the 1st hole or Ripper dies. This is done for several reasons. First, to allow plenty of lubrication to get on the rod; second, to allow room for any foreign material on the rods to get out of the die; third, rods vary in size and the large opening allows for out of round rods, wings, and so on, to get into the die without scratching.

d. 25° and 30° angles are rarely used for wire drawing, but are used for drawing tubes. The 30° angle in tube drawing is as universal as the 16° angle in wire drawing.

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Question: Which is the best angle to use on the Ripper die for the most lubricant when the wire in intermediate dies is wrapped with waste?

Answer: Probably the best angle for a Ripper die is 20°. However, many use 18°, some 22°, and a few 24° angles for Ripper dies.

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Question: Does greater angle in the intermediate dies leave more lubricant on the wire than a lesser angle assuming having lubricant in Ripper die only, balance of four holes wrapped with waste?

Answer: I doubt that the size of the angle on intermediate dies has any great influence on the amount of lubricant left on the wire. If a very tight angle were used, then it would probably reduce the lubricant left on the wire and would also cause trouble.

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Question: What's the logic behind wrapping the wire with waste?

Answer: This is a good question that makes for interesting study. This answer may cause controversy, but the writer believes that wrapping the wire with waste serves only to take loose slivers of steel off the wire, which would otherwise get into the dies and cause scratching of the wire. It might serve to take excess lubricant off the wire if the drawing was through a soft grease.

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Question: How often should the lubricant be changed in the ripper box? How do you know when it should be changed?

Answer:

a. The second part of this question makes answering the first part easy.—As often as necessary.

b. When the wire drawing operation is working smoothly, it should be kept that way. In other words, do not change the lubricant in the die box but add to it as often as necessary. The lubricant should be stirred quite often. Dirt comes off the rods and contaminates the soap at the entrance of the die, and by stirring the soap a fresh supply of clean soap is available for the rods to pick up. Experience is the best teacher for this job. Explanation by writing is difficult.

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Question: When you use 12° entrance angles on intermediate dies, what angle should the ripper be?

Answer: Probably 16° or 18° angle.

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Question: When you use 16° to 20° angles on the intermediate dies, what angle should the ripper be?

Answer: If 16° to 20° angles are used on intermediate dies, it is probably because the drafting is heavy, but it would be well to use 22° to 24° angles on Ripper die.

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Question: Which are the best angles to use on low carbon, medium carbon, and high carbon wire and why?

Answer: Low carbon wire generally does not have to pass any specification tests so, consequently, it is drawn to the best advantage of the wire drawing machine. Heavy drafts are generally taken requiring larger angles; 20° on Ripper; 16° on intermediate and finish dies.

Medium carbon is somewhat the same.

High carbon and high tensile rope wire must pass specification tests. Total reduction of area required dictates the drafting practice that must be used. High carbon wire is seldom drafted over 30% on each pass, and a tighter angle can be used. Angles are generally 16° on Ripper, 14° on intermediate, 12° on finishing die under .080" diameter. On larger than .080" diameter 14° angles are used for finishing dies too. A die made for drawing high carbon spring wire must have a sharp line at intersection of angle and bearing or the wire will not lie flat—it may birdcage or figure eight.

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Question: Will the wire pick up lubricant in the intermediate dies if you put lubricant in all the boxes?

Answer: Yes, a little. The wire is traveling faster and is also smoother and only the finest of the soap will be picked up and carried.

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Question: When you are drawing 5 hole wire and the wires gets scratched on the third hole, would it pick up enough lubricant to carry thru to the finisher if you had lubricant, say, in the fourth hole?

Answer: The answer is no.

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Question: How important is it to keep

(*Please turn to page* 703)

Questions and Answers

A series of questions from one of our readers and the answers to them, given by a leading carbide die manufacturer, are reproduced herein with the belief that they may interest others who have drawing problems.

The difficulties encountered that gave rise to the questions relate to the drawing of low carbon steel wire from purchased rod.

Large Scale Continuous Annealing of Coils With Carbon Restoration

by J. D. Armour, Chief Metallurgist
Union Drawn Steel Division
Republic Steel Corporation
Massillon, Ohio

A continuous pusher tray type controlled atmosphere furnace is used for the continuous large scale annealing of cold drawn rod and wire in coils. Cold forming and automatic machining stock is produced without surface decarburization in a 6-zone gas-fired furnace. Standby power and atmosphere facilities assure uninterrupted production.

In conventional annealing processes, carbon is lost from the surface of steel bars. This decarburization makes the surface of the bars too soft for use in many industries, necessitating the removal of low carbon surfaces by machining or grinding.

Controlled Atmosphere Equipment Utilized

To alleviate this situation, experiments were begun in 1940 to develop a suitable atmosphere for protection during annealing. Prepared atmospheres of partially burned natural gas, charcoal gas, nitrogen, and finally the present endothermic type RX* generator gas that is used for gas carburizing were tested.

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The original furnace equipment suitable for annealing in controlled atmosphere gas was designed and built by Surface Combustion Corporation, of Toledo. It was of the lift cover car bottom type (1) and was the first successful application of batch type annealing of bars at high temperatures without scaling or decarburization.

As production increased in volume, a roller hearth furnace was placed on the line to anneal and carbon correct bar stock continuously in an atmosphere of NX* generator gas and RX generator gas plus a small amount of natural gas. (2) Although this 6-zone Surface Combustion furnace was designed for both bar stock and coils, demands on it for critical jobs became so great that a special furnace was designed and built by the same furnace equipment company for continuously annealing only coils.

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A considerable fund of information on the theoretical and practical aspects of carbon concentration control has been assembled over the ensuing years. (3) No attempt will be made to review them completely, although a brief summary of the basic fundamentals is included as a footnote (4) in this paper for reference.

Pusher Type Furnace for Coil Stock

The controlled atmosphere pusher tray furnace is about 86 feet long with atmosphere vestibules at each end. (See Fig. 1) The inside width is 10 feet, which permits 2 rows of coils to be pushed through the furnace on trays, two at a time. Each tray holds up to 1500 lbs. of work. With 13 trays in each row, the entire furnace can hold nearly 40,000 lbs. of work. About 1000 tons of coils, ranging from ⅛ to ¾ inch round are annealed each month in this furnace.

Two Basic Furnace Cycles

Since about 90% of all production from the coil furnace is for either cold forming or automatic machining operations, only two basic furnace cycles are required as most of the steels annealed are within the 0.35% to 0.50% carbon range. Cycle I is a sub-critical anneal and produces a structure ideal for most cold forming operations. Cycle II is an over-critical

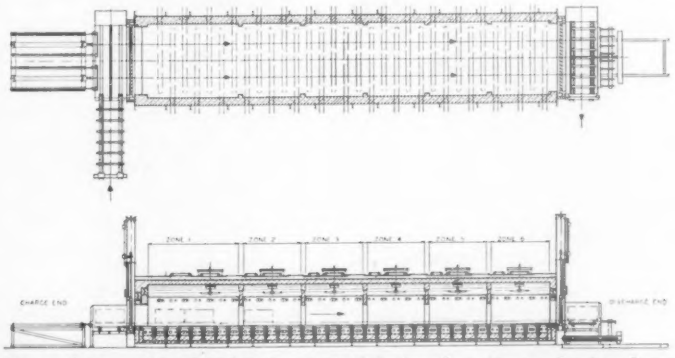

Fig. 1—Cross section of pusher tray controlled atmosphere furnace showing charge and discharge vestibules, radiant tubes above and below work and 6-zones of temperature control

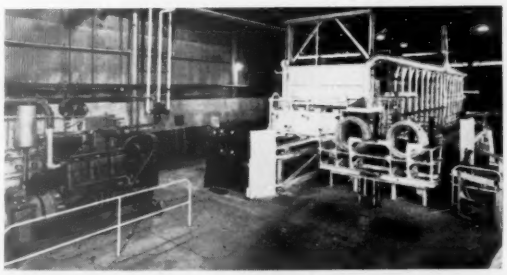

Fig. 2—Overall view of furnace from charge end. Note coils in vertical position against trays as placed by fork lift truck. Tray loads will be tipped back to horizontal position for charging into furnace. Furnace control panel is at left foreground and charge table control panel at right.

* Trademarks of Surface Combustion Corporation.

anneal that produces a structure ideal for use in automatic machining operations. Both of these cycles as shown in Table I produce stock that is carbon corrected on the surface. The controlled atmosphere used for all processing in the heating chamber and in both vestibules is produced by an RX gas generator. A typical analysis of this gas would be CO_2—1.4%, CO — 18.7%, CH_4 — 0.5%, H_2 — 34.5% and the remainder nitrogen. With the generator gas dewpoint held between +65 to 80F, the carbon potential of the atmosphere is in good balance with the 0.35 to 0.50% carbon steels at the temperatures being used. These steel grades include AISI 4000, 4100, 5100, 8100 and 8700. The photomicrographs in Fig. 3 show the type of structure and uniformity of carbon throughout the section when these basic cycles and straight RX generator gas are used.

TABLE I.

BASIC ANNEALING CYCLES WITH CARBON CORRECTION

CYCLE	ZONES 1	2	3	4	5	6
I*	1400F	1420F	1275F	1275F	1275F	1100F
II**	1500F	1500F	1500F	1260F	1200F	1200F

Steel grades include: AISI 4000, 4100, 5100, 8100 and 8700 with carbon content ranging from .35% to .50%. These constitute 90% of production.

*Sub-Critical Anneal; **Over-Critical Anneal.

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Up to 3600 cfh of RX generator gas is required for full production. For those operations requiring a higher carbon potential, enriching natural gas can be added as required. To check the dewpoints, a six-station Surface Combustion automatic dewpoint recorder is used. Dewpoints of all zones and the generator are recorded consecutively and automatically as follows: Station 1—RX gas generator. Stations 2 to 6—First five zones of the furnace. Orsats are also taken once a week at the generator and intermittently in the furnace.

Zones of Controlled Temperature

For maximum flexibility in processing, the heating chamber is divided into 6 zones of individually controlled temperature. Each zone is equipped with a recirculating fan to provide maximum uniformity of temperature and complete exposure of the stock to carburizing atmosphere. The closeness of control required is reflected in the range of typical specifications shown in Table II. They are representative of varying specifications demanded by customer requirements. Even the closest must be met every time. To check production from the furnace, samples are taken from every "push" of two trays and hardness and microstructure determinations are made.

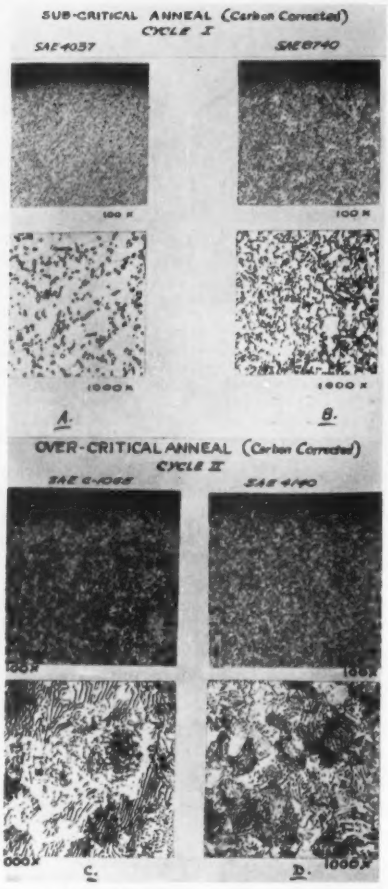

Fig. 3—Photomicrographs of different steel grades using the two basic cycles for annealing: A—Cycle I: SAE 4037; B—Cycle I: SAE 8740; C—Cycle II: SAE C-1055; D—Cycle II: SAE 4140.

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These hardness figures, after annealing, are actually lower than those of the final product. This is due to the fact that after annealing, the stock is pickled, limed and mechanically cold drawn to desired size. The amount of reduction in this latter operation will vary according to end product requirements.

TABLE II.

TYPICAL REQUIRED SPECIFICATIONS--BRINELL HARDNESS AFTER ANNEALING

CYCLE I SUB-CRITICAL ANNEAL		CYCLE II OVER-CRITICAL ANNEAL	
STEEL (AISI)	MAXIMUM BRINELL	STEEL (AISI)	MAXIMUM BRINELL
4042	160	4037	151
4140	170	4140	174
5140	166	8127	148
8740	170	8740	174
8735	156	8735	160

Cycle I production must show speroidized structure.
Cycle II production must show lamellar pearlite structure.

Cycle of Furnace Operation

The furnace is charged by a fork lift truck equipped with special coil carrying prongs. This truck places the coils in a vertical position in a special loading rack containing the trays which have also been tipped on end. The coils are placed against the trays in this manner and the entire rack tipped back to bring the tray-coil load into proper position. They are then pulled forward by retractable "fingers" onto the charge car ready for the automatic furnace cycle which is started by the furnace operator.

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This cycle of operation is completely automatic after the charge car, carrying two 56" x 56" trays of coils, moves into the charge vestibule. (See Fig. 4). This vestibule is then purged of all air by atmosphere gas.

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As the next step in the cycle, the inner door of the discharge vestibule opens and two trays are pulled on the car in this chamber. The inner door closes. The discharge car moves out of the vestibule, coils are unloaded by pusher mechanism, and car returns into the vestibule. (See Fig. 5).

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At this moment, the inner door of the fully purged charge vesti-

Fig. 4—View of charge end of furnace showing charge car, with two trays, ready to enter charge vestibule of furnace to the right. * *

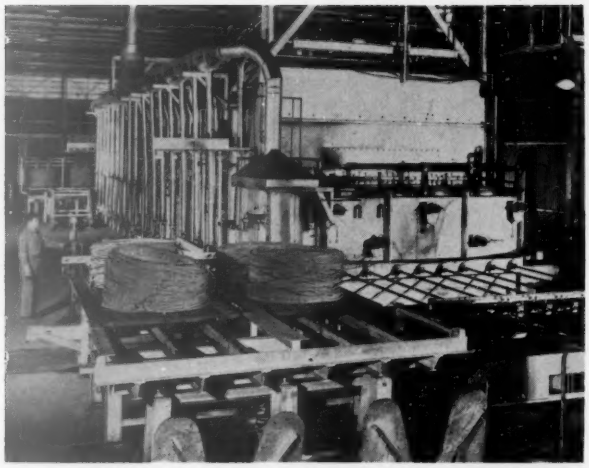

Fig. 5—Discharge end of coil annealing furnace with 4 trays ready for unloading by fork lift. Discharge car has been moved back into the furnace and tray pushed forward by pushover mechanism back of coils.

bule opens, two loaded trays on the charge car are pushed into the furnace and the inner door closes again. This purging is also carried out at discharge end before vestibule is opened to atmosphere-filled furnace heating chamber.

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Unloading of coils at the discharge end is accomplished by the same fork lift truck using a reverse of the tray-coil handling procedure employed at the charge end.

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Time in the furnace from charge vestibule to discharge vestibule can be varied to suit the annealing cycle but the shortest push interval is every ¾ hour.

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Suction-type, gas-fired, radiant tube heating elements are used throughout the heating chamber. They are located above and below the work. A slight positive pressure of atmosphere gas is maintained in the heating chamber and a slight negative pressure is maintained inside each radiant tube. This prevents the contact of detrimental products of combustion or room air on the work in case of failure of one of the heating tubes.

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Using natural gas as fuel on the furnace and generator, an average 6 months fuel cost would be about $2.75 per ton of steel processed by the furnace. This figure includes fuel cost during heating up or during non-productive hours with furnace at temperature.

Standby Facilities

To insure continuous uninterrupted production, maximum safety for the personnel and equipment and to minimize stock loss or damage, standby power and inert purge gas supplies are provided for this equipment.

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Uncontrollable interruptions such as power failures and gas failures, will shut down the furnace and stop the regular atmosphere supply. Since some portion of the furnace is always below 1400F, this necessitates operating on standby power or purging the furnace chambers and vestibules with an inert gas. This is particularly important for furnaces containing high percentage of combustible gases that operate below 1400F. In such cases, standby facilities are incorporated primarily to eliminate any hazardous condition.

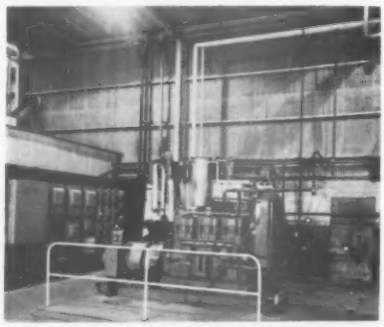

Fig. 6—Standby engine generator set provides emergency power in case of power interruptions. Note RX gas generator immediately in back of the natural gas engine, generator set. * * *

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A gas engine generator set (See Fig. 6) provides power to all furnace equipment automatically in case of power interruption. It is standard practice to start up this unit as soon as a storm threatens or other conditions develop that might interrupt power. This natural gas engine equipped unit has been started-up many times under just such conditions.

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An inert gas storage system supplies purge gas for the furnace heating chamber and vestibules. Inert (high nitrogen) atmosphere from an NX gas generator is stored in a tank under pressure. The purpose is automatically to provide an emergency supply of inert NX gas for purging the furnace in the event of failure of the carrier gas units.

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Standby facilities are a precaution that assure maximum production by keeping this furnace on the line in spite of uncontrollable utility interruptions. In addition, they assure maximum protection for personnel and equipment and minimize furnace "downtime."

(*Please turn to page* 700)

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Controlled Pressure (Valve) Extrusion

by

B. H. Maddock, H. J. Nalepa and B. Zurkoff

Bakelite Company

A Division of Union Carbide Corporation

New York, New York

This paper was presented at the Sixth Annual Wire and Cable Symposium sponsored by the Signal Corps at Asbury Park, N. J., on December 5, 1957.

I. Introduction

Following Bakelite Company's development of the new extrusion technique known as controlled pressure (valve) extrusion, general information on the subject has been presented in a number of papers and publications, and at various seminars and meetings.(1) (2) The many inquiries received, not only indicate that the industry is fast becoming aware of the importance of the development, but also point out the many areas of activity affected by it. The interest aroused is not surprising, for a practical method of improving not only extrusion product quality but output rate as well, is bound to receive every extruder's serious consideration. In order that the information available on the subject may better serve future activities related to controlled pressure extrusion, it has been consolidated in this paper. The paper reviews the fundamental principles involved and how these principles can be utilized in various applications.

II. Summary and Conclusions

The development of controlled pressure (valve) extrusion provides the industry with a new and practical tool that substantially improves extruder performances. It enables fabricators to improve extrusion product quality and to maintain it at a commercially acceptable level at the top screw speed of which the machine is capable.

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The technique of valve extrusion is based on the fact that quality is improved by increasing the operating pressure in the extruder. Increasing the pressure increases the mixing efficiency of the screw. This results in improved thermal and mechanical homogeneity, which in turn is reflected in improved product quality.

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Although screen packs are often used to increase pressures, they not only have the disadvantage of giving a fixed pressure, but the pressures developed are low. A mechanism which permits operation over a wide range of pressures and gives instantaneous and continuous control of pressure is a valve installed between the screw and die.

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The improvement in quality obtained with the increased pressures made possible by the valve permit operation at higher screw speeds and greater output rates. In many commercial extrusion applications, particularly those involving heavy cross-sections and low resistance dies, such as sheeting, the output is limited by an acceptable quality level and not by the inherent delivery capacity of the screw or power capacity of the drive. In such cases quality can be maintained at higher output rates by simultaneously raising the pressure (by means of a valve) and screw speed until the maximum screw speed or power capacity of the motor is reached. In actual case studies, a valve was found to double the normal output rate of an extruder. The output rate could have been increased even further, had additional screw speeds been available.

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The principles of controlled pressure extrusion have been shown to apply to all thermoplastics. To cite a few examples, the technique was successfully demonstrated in wire coating with vinyl dry blends, sheet extrusion with polyethylene and impact polystyrene and rod extrusion of polyethylene.

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An important consideration in the design of the valve used is that it must be free of dead spots which result in hang-up of material. Since no suitable valves were available commercially, Bakelite Company designed and built several valving mechanisms which have been successfully demonstrated.

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The advantages of controlled pressure extrusion make it apparent that its development constitutes a major contribution to extrusion technology and production economy.

III. Discussion

A. Theory of Mixing

Mixing takes place in an extruder screw primarily as a result of shearing action between the screw and the cylinder wall. Several complex flow mechanisms contribute to this shearing action. These include the forward or drag flow developed by the pushing action of the rotating thread, back flow through the screw channel and over the thread lands caused by pressure developed by the die restriction and a circulatory flow which takes place entirely within the channel. All of these may be considered as having components of shear which can be summed to give a total rate of shear. The exact mechanisms involved, however, have not been accurately defined. If one then visualizes shearing taking place at a total

rate determined by shearing stresses in several directions, it is also seen that the time during which the shearing action occurs becomes a significant factor. The overall mixing intensity is thus a function of the total rate of shear and the residence time in the shearing area.

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The rate of shear in a material bounded by two planes moving in opposite directions is defined as the relative velocity of the two planes divided by the thickness of the material. In the case of an extruder screw, the rotational shear rate is equal to the surface velocity at the cylinder wall divided by the channel depth. This may be written as: $\delta = \frac{\pi DN}{h}$ sec. $^{-1}$. D equals the diameter of the cylinder in inches, N equals the screw speed in revolutions per second and h equals the channel depth in inches.

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While it was previously indicated that flow mechanisms also contribute to a total rate of shear, it is found in practice that the rotational shear is by far the largest component and that most of the performance characteristics can be defined from consideration of this factor alone. The equation indicates that the shear rate increases with increasing screw speed and with decreasing channel depth. The shear rate is thus a maximum where the channel depth is a minimum, in the metering section if used, or at the exit end of the screw. It is in this area that the mixing intensity is greatest. Decreasing the channel depth in the metering section not only increases the rate of shear at a given screw speed, it also reduces the output so that a higher screw speed would be necessary to regain the original rate. This results in a still further increase in shear rate. Increasing the length of the metering section, preferably by increasing the length of the screw, improves mixing because of the increased material inventory and residence time in the metering section.

B. Effect of Pressure

The pressure developed at the end of the screw causes back flow through the screw channel, opposes the forward flow and reduces the output rate. Normally, the greatest resistance to flow is offered by the die itself and it is usually this factor which determines the magnitude of the pressure. The resistance of the screw channel to back flow determines the magnitude of the back flow. Thus, a screw having a very shallow channel depth in the metering section (1/16 of an inch or less) will have a high resistance to back flow and its delivery rate will not drop off rapidly with increasing pressure or die resistance. The shear rate in such a screw is relatively high because of the shallow channel, and the mixing efficiency is fairly good even with large dies and low pressures. Frictional heat generation is also large in such a screw and may be excessive for heat sensitive materials such as polyvinyl chloride. In commercial screw design, it is usually necessary to compromise between output rate and product quality in determining a satisfactory channel depth. However, in many instances output has been emphasized at the expense of quality.

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In deeper channel screws where the effects of pressure on back flow and output rate are more pronounced, it is found that the mixing efficiency and product quality are improved by raising the pressure. While this does result in some increase in the rate of shear, as previously indicated, the major effect of pressure on mixing is now seen as one arising from the resultant reduction in output rate and increase in residence time. This is similar to the effect of a reduction in channel depth.

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The increase in residence time and rate of shear brought about by increasing the pressure also raises the stock temperature. This effect is more pronounced with the deeper channel screws which, at low pressures, give a low order of frictional heat development.

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Since the die for a particular extruded product has a fixed resistance, the pressure developed may not be sufficient to give optimum mixing and product quality. It is then desirable to introduce some auxiliary method for raising the pressure. This can sometimes be accomplished by means of screen packs or fixed orifices, but these methods lack flexibility. By inserting an adjustable valve between the screw and the die, the pressure can be increased to any desired value to give the operator instantaneous and continuous control over product quality. While the increased pressure causes a reduction in output rate, the original rate can be regained and usually exceeded by simultaneously increasing both the pressure and the screw speed. In fact, this process can be continued until either the top screw speed or the maximum available drive power is reached, thereby achieving the full capacity of the system with acceptable product quality.

C. Quality Characteristics of Screws

It is found in practice that a particular screw has a definite quality characteristic which can be defined in terms of rate and pressure, and plotted as a boundary condition on the familiar rate versus pressure operating diagram. This is illustrated in Figure 1 for a typical 2.0 inch diameter, metering type screw, having a channel depth of 0.094 inches in the meter-

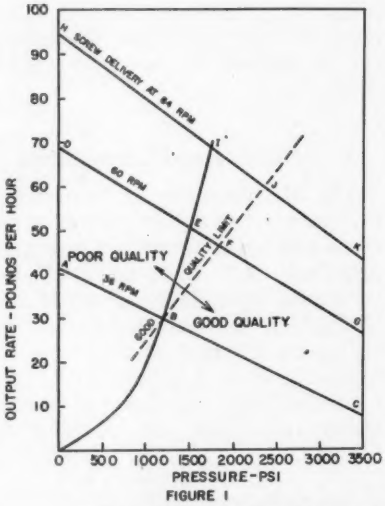

FIGURE 1

PRESSURE-QUALITY RELATIONS IN EXTRUSION 20 MELT INDEX POLYETHYLENE AT 180 °C

NEWS OF INTEREST TO THE WIRE AND CABLE INDUSTRY VOL. [illegible] No. 3

WIRE Recorder

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Science Featured at Brussels World's Fair

From the gigantic 320-foot Atomium to the Walt Disney produced "Circarama," the keyword to the 1958 World's Fair at Brussels seems to be science. Virtually all of the world's great nations are represented at the fair, and each in one way or another has included exhibits showing the technological advances of their respective countries.

While the United States pavilion has placed less emphasis on the mechanical side of modern living than on the relaxation and enjoyment of life in America, they have all the same utilized science to a large degree in displaying these facets of life in the United States.

The pavilion itself, designed by Edward Stone, is constructed largely of steel and gold aluminum with a roof of transparent plastic. One of the popular attractions within the building is a display model of Monsanto's "House of the Future." The model is an exact duplicate of the Plastic House which is on display at Disneyland, California. Another big hit in the U. S. pavilion is the "Circarama," a 15-minute Disney-produced movie of America the

(*continued on page 4*)

BRUSSELS, BELGIUM, APRIL 18 — Monsanto House of the Future on display at Brussels World's Fair is inspected by American guides in the U. S. Pavilion. They are Kaye Karlan of Denver and James A. Rigford of Meridian, Mississippi.

Electrical Engineering Education and Research in the U. S. S. R.

A recent report compiled by Dr. Pier A. Abetti, manager of systems research for the General Electric power transformer department at Pittsfield, Massachusetts, and G. Fred Lincks, standards engineer at the same installation, has indicated a marked change in Soviet attitude in the matter of exchanging information on electrical engineering with nations outside the Soviet block.

Mr. Lincks attended a Moscow meeting of the International Electrotechnical Commission last year along with some 400 other delegates from 27 nations. During his two-week stay behind the "iron curtain," he toured the Soviet Union visiting a variety of manufacturing plants and training institutes. Lincks has reported that the Russians "really welcomed" this exchange of information with foreign representatives. He has also stated that "If the truth be known, they set United States mass production methods and living standards high on a pedestal. In fact, we set up more of an Iron Curtain than they do in many fields."

Lincks was able to bring back numerous books, technical papers and periodicals which Dr. Abetti has translated. The two men worked together in the preparation of the final report.

One of the major points made in the report was the rapid advances made in Soviet electrical technology, which has now reached a stage where the Soviets are about to surpass Sweden in the field of extra-high-voltage. Where the Swedes now transmit power over long distances at 400 kilovolts, the highest rate of voltage now being used, the Russians are concentrating on a transmission system ranging up to 800 kilovolts. U. S. industry at the present time "is

(*continued on page 4*)

BRITAIN AND CANADA TO BE JOINED BY TRANSATLANTIC CABLE - A new transatlantic telephone cable to be laid between the west coast of Scotland and Newfoundland will provide for telephone and telegraph requirements between Great Britain and Canada for an estimated twenty years. The project, which is to cost approximately $25.2-million, is to be available for service by mid-1961. The cable will provide at least 60 telephone circuits and will be owned jointly by Canadian Overseas Telecommunications and Cable and Wireless Ltd.

* * *

$100-MILLION GENERATING STATION OPENED AT LINDEN, NEW JERSEY - The Public Service Electric and Gas Company has opened a new generating station at Linden, New Jersey, with an initial capacity of 450,000 kilowatts. Two units of 225,000 each have been installed with provisions for additional machines as needed. The company has already increased its electric generating capacity by more than 100 per cent since World War II, and has new generating stations under construction in Bergen and Mercer Counties in New Jersey.

* * *

ARGONNE REACTOR TRIPLES PRODUCTION - Recent tests in which the Argonne Reactor has been operated at 61,700 kilowatts of heat have indicated that no change is required in the number of nuclear fuel elements in the core of the reactor to reach this level. This increase in the power level is regarded as a highly important advance in the Atomic Energy Commission's search for methods to produce competitively priced electricity from nuclear energy.

* * *

KITCHEN ELECTRONICS - High voltage makes short work of cooking, but guesswork will not be allowed in the kitchens of tomorrow. Electronic kitchens, costing from $1,200 to $1,500, have been developed by the Hotpoint Company. The "out-of-this-world" electronic cooking centers are capable of cutting cooking hours to one-fifth of the present time. Other advantages of the new system are the elimination of dirty pots and pans and the rapidity with which frozen foods can be cooked with microwaves.

* * *

INADEQUATE AIRFIELDS HOLD UP JET-AGE TRANSPORTATION - Jet airliners, capable of crossing the country in 4½ hours, could be delivered tomorrow, but the lack of sufficiently equipped airfields is holding up their introduction. A $600-million program to modernize airports is now in the planning stages to accommodate the modern speed giants.

* * *

MACHINES NOW READ AND SORT TYPED ADDRESSES - An electronic machine, capable of reading ordinary typewritten addresses on envelopes, has been developed by the Intelligent Machines Research Corporation of Alexandria, Virginia. The electronic wizard not only reads the addresses but also sorts letters by city and states and files them in individual slots. Unfortunately, the machine is illiterate where handwritten addresses are concerned.

Nationwide Order-Processing System Introduced

A high-speed nationwide order-processing system that places completed orders on mills the same day they are taken is boosting business for Republic Steel. A coast-to-coast network linking district sales offices with mills sends a complete mill order form by punched tape and teletype from sales offices to the mill in the same day it is received. In the past a week's time was required, with a total of 33 forms being utilized in the process as compared with a single sheet order with the new system.

The recently completed network, considered the most elaborate in the industry, is capable of handling up to 1,000 orders in an average market. It has been of great value in today's loose market in drastically cutting the time required for paperwork to catch up with mill production.

Mr. N. W. Foy, vice president of sales at Republic, has described the operation as being the "fastest and most efficient system for handling customer orders and inquiries of any steel company in the country." Republic was also the first steel company to utilize a teletype ordering system.

The basic operation of the new system begins with district sales offices where a punched tape record is prepared with all sales information on an order. This information is transferred by wire to product departments, which in turn transmit it to the mill. Each district message is duplicated verbatim in product department service centers and in the central sales office. All necessary information is included on the initial tape without any additional typing required anywhere along the line. Taped information is retained on a file of 10,000 customers so that only variables need be retyped on successive orders.

Republic's new system was developed by E. C. Mausz, the company's procedure committee chairman, and Russell Widner, assistant commercial research director, with the help of about 40 other representatives of various committees. The work was accomplished over a period of three years at a cost of well over $1-million in rebuilding and relocating offices and service centers in the mills, product and district offices. The equipment used is leased from the American Telephone and Telegraph Company.

Super-Radar Meets Challenge of Space

The problems of sighting and tracking intercontinental ballistics missiles are being met rapidly and effectively by a highly sensitive system of high-powered radar developed by the U. S. Air Force together with leading electronics firms.

The necessity of detecting ballistic missiles by radar in time to combat them is vital to national defense at the present time. The development of the DEW-line radar system, over 1,000 miles from the borders of the U. S., gives the Strategic Air Command roughly a two-hour warning of approaching aircraft. This warning, although the forerunner of the new system, is not sufficient for combating missiles.

At the present time the Air Force is working with RCA, Sylvania, and General Electric on a new system that will give sufficient warning on ballistic missiles. The new project will be based on a successful installation that has been in operation in Texas, where a prototype has been inspecting the skies 500 miles to the northwest observing and reporting the presence of missiles being tested at Hollonam Air Force Base and at White Sands. The installation was developed by General Electric and has proved to be a valuable source of information in designing a complete early warning system against ballistic missiles.

This new chain of warning stations will not replace the DEW line, the Air Force has reported, inasmuch as "the detection and location of aircraft and missiles present two different sets of problems." The new system will watch for missiles rising as much as 3,000 miles away. The designs for the project are already completed with work to be accomplished in less than two years.

In order to track missiles at a distance of 3,000 miles, the system must be highly sensitive, operating with a peak power of 7-10 megawatts and an

(*continued on page 4*)

NEW JACKETING COMPOUND ADDED TO OPALON LINE OF PRODUCTS

A new jacketing compound, Opalon 1218, has been added to Monsanto's list of leading jacketing materials. The new product has proved to be ideal when used as the inside distribution for wire jackets and for general purpose jacketing where higher operating temperatures are required.

Opalon 1218 is a jacketing compound especially noted for its toughness, long service life and ease of extrusion. Properties of Opalon 1218 determined on a 75 gauge molded specimen are as follows:

	ASTM Procedure	
Specific gravity, @ 23°C	D-792	1.38
Hardness, Durometer A, @ 23°C	D-676	88
Tensile Strength, psi, @ 23°C	D-412	2400
Ultimate Elongation, % @ 23°C	D-412	320
Modulus, @ 100% elongation, psi	D-412	1250
Brittleness Temperature, °C	D-746	−29
Flex Temperature, T_f, °C	Clash-Berg	−21

In addition, constructions jacketed with this compound with approximately a one-inch diameter have met all requirements of ASTM D-1047-49T with the cold bend temperature at −40°C. This compound joins the other outstanding Opalon jacketing materials already on the market. A review of these compounds and their recommended uses are as follows:

Compound	*Application*	*Temperature Range*
Opalon 1102	Weather resistant jacket for use at moderately low temperatures	−45°C to 60°C
Opalon 1217	Inside distribution wire jacket and general purpose jacketing with excellent oil resistance at normal operating temperatures	−40°C to 60°C
Opalon 1218	Inside distribution wire jacket and general purpose jacketing for higher operating temperature uses	−40°C to 80°C
Opalon 1444	Deformation resistant jacketing with high temperature rating—very low contaminating with primary insulation	−20°C to 105°C

New York City Leads Nation With Large-Scale Building

New York City, the nation's leading metropolis, is also in the lead with numerous large-scale building projects either under way already or in the advanced planning stages.

The largest project in the works for the city involves the twelve-block $205-million Lincoln Square project. Included within this program are the Lincoln Center for the Performing Arts, a downtown campus for Fordham University, a housing project that will cover several blocks, a group of retail stores, and a Red Cross chapter headquarters.

Within the Lincoln Center, the Metropolitan Opera Company will erect a new opera house, a large concert hall will be built to replace New York's famed Carnegie Hall (which is itself being razed to make room for a skyscraper office building), a theatre for the dance, and a legitimate theatre to accommodate a permanent repertory company.

The area will also include a new home for the Juilliard School of Music, several restaurants, a museum for the performing arts, a library, and New York's High School of Commerce. Underground garages will provide complete parking facilities for patrons of the various music and theatre attractions in the center.

Work has already begun on demolishing the existing buildings in the area in preparation for the start of construction on the housing development. The first building scheduled for completion in the center for the performing arts is the concert hall, which will be ready for performances in 1960. The final part of the program is scheduled for completion by 1963.

In another slum area west of Central Park, New York has planned a program that will renew a twenty-block area within the boundaries of Central Park West and Amsterdam Avenue, from Eighty-seventh to Ninety-seventh Streets. This section of the city would be rehabilitated with some buildings being demolished, others rebuilt, and still others accepted in their present condition. A public housing project for low-income families is also included in the plans.

In still another recent move, plans were proposed for the continuation of the Astor Plaza project which had been at a standstill because of limited financial backing. The project is once more under way on an even larger scale than had been originally planned. Among other building projects in Midtown Manhattan is a new building for TIME and LIFE — as part of the growing Rockefeller Center section of town. There are several other structures planned for this area, too.

U.S.S.R. (*continued from page 1*)

only in the talking stages of experimenting" with a 500 kilovolt system. High tension lines in the U. S. at the present time are generally rated at 132 kilovolts.

Dr. Abetti has stated, "There is no doubt that the Russians will lead the way in this field." Another point which was emphasized in the report was the fact that 70 per cent of all Soviet engineers can read technical English, since English is a required subject for all students in the Russian public school system. He also pointed out that last year some 70,000 engineers were graduated from Russian universities, compared with only 34,000 in the United States.

Among the conclusions arrived at in the Abetti-Lincks report was the belief that the U.S.S.R. has succeeded in instilling an understanding and respect for the scientific approach in all of its people by early teaching of science, using a high percentage of classroom time, regardless of whether the student will eventually dig ditches or become an engineer. The Soviets also concentrate very heavily on the training and use of engineers in developing and carrying out the present and future planned growth of their country. The electrification of the entire country has held an extremely high priority since 1920, and has produced genuine results in educational progress, research facilities, and in the creation of equipment and operating systems that meet Soviet requirements.

The final conclusion of the report states, "The people of the U. S. A. and the world should recognize that in the future this high standard of education and research, coupled with the ability to get extreme concentration in any desired area, will give the U.S.S.R. technological firsts in more areas than the artificial satellite (Sputnik)."

Science (*continued from page 1*)

Beautiful, projected on a 360° screen.

More than fifty U. S. firms are participating in the fair, with displays either in the main pavilion or with independent exhibits in specially constructed buildings. One-fifth of this number are concerns within the field of electronics. Two of the 55-foot spheres in the Atomium itself are occupied by U. S. electronics firms, with Westinghouse showing a 26-foot walk-in model of a pressurized atomic water reactor. A similar reactor is also displayed in the State Department exhibit in the U. S. pavilion where a two-thirds scale model demonstrates the flow of electricity from atomic power to a typical American community.

Sylvania Electric occupies one of the Atomium spheres with a display of man's search for fuels. In a second Sylvania display in the main Transportation pavilion, computers are teamed with space crews to develop rapid calculations to meet the demands of space travel. Also included in the Transportation pavilion is a display showing how "Electronics Advances Aviation Progress." In the IBM exhibition hall a Ramac is on display producing answers in ten languages in ten seconds.

Super-Radar (*cont'd from page 3*)

antenna system with a toroid-section reflector more than 300 feet high.

Multifrequency transmissions are expected to be utilized to increase the average power while still maintaining a maximum range. In addition to increasing average power without reducing range, the multifrequency technique will considerably reduce the possibility of a high-speed flying object crossing a tight radar beam between pulses without being observed.

The element of human error will also be removed with the new technique through a computation-presentation system which will be "taught" the echo pattern of a rising missile. It will then compare information picked up on each scan with its recorded pattern. As soon as an unpredicted echo is picked up, the computer will make use of its learned rise pattern to figure out where the next echo will come from. Within approximately one second the computer will be able to predict the location of the probable target. The system will then plot an intercept course and provide necessary information to direct countermissiles.

MONSANTO CHEMICAL COMPANY
PLASTICS DIVISION—SPRINGFIELD, MASSACHUSETTS

ing section and extruding 2.0 melt index polyethylene at a temperature of 180 degrees Centigrade. Lines AC, DG and HK represent the screw delivery as a function of pressure at screw speeds of 36, 60 and 84 rpm respectively, the last mentioned being the maximum speed of the machine. Curve BEI is a characteristic rate versus pressure curve for an extrusion die having a diameter of 0.100 inches and a length of 0.500 inches. Broken line BFJ is the boundary between regions of acceptable and unacceptable quality production as determined by experience. It is seen that satisfactory quality was achieved at point B with a screw speed of 36 rpm, a pressure of 1200 psi and a rate of 30 pounds per hour. Any attempt to increase the screw speed and output rate toward points E and I resulted in quality degradation.

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However, by means of a valve between the extruder and the die, it was possible to increase the pressure and screw speed simultaneously to point J thereby achieving satisfactory quality at the maximum screw speed with a rate of 60 pounds per hour and a pressure of 2350 psi. The output rate of good quality product was thus doubled and the full capacity of the system realized. For dies of lower resistance (larger cross-sectional area or shorter length), the die characteristic curve would fall to the left of the one shown in Figure 1 so that a still greater increase in pressure would be necessary to move into the good quality operating region. For higher resistance (smaller) dies, normal extrusion would occur in the good quality region and no additional pressure would be necessary, but applications requiring such high resistance dies are in the minority.

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Quality was evaluated in these investigations by extruding tumbled mixtures of natural and colored polyethylene and noting the degree of color dispersion in the extruded product. The color is used as a visual aid. Poor color dispersion is indicative of nonhomogeneities which are frequently manifested as surface roughness and degradation of other mechanical properties. Quality extremes are illustrated in Fig. 2. When the quality is referred to as "acceptable" or "good," the type of dispersion and uniformity shown on the right hand side of Fig. 2 is meant.

FIGURE 2

Three additional 2.0 inch diameter screws, having the dimensions shown in Table I, were evaluated in the same manner, determining the good quality boundary limits and plotting them on the rate versus pressure diagrams.

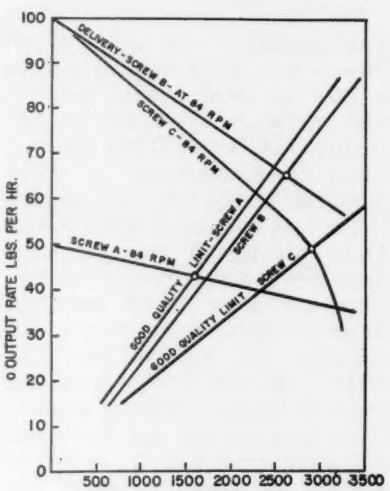

FIGURE 3
QUALITY COMPARISON OF THREE SCREWS POLYETHYLENE AT 180° C

TABLE I
2.0 inch Diameter Screws

Screw Type	A Metering	B Decreasing Depth	C Decreasing Pitch
Pitch at feed, in.	2.0	2.0	2.9
Pitch at discharge, in.	2.0	2.0	0.75
Depth at feed, in.	0.370	0.281	0.33
Depth at discharge, in.	0.062	0.126	0.38
Compression Ratio	5.4	2.0	4.0

A comparison of the three screws at 84 rpm, the maximum screw speed of this machine, is shown in Fig. 3. The good quality boundary lines for screws A and B are seen to be similar in location and slope, while that of the decreasing pitch type screw C, is different in both respects. It is also noted that the output rate with screw C dropped off rapidly at pressures above 2500 psi.

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The maximum delivery of good quality product obtainable with screw A at the maximum screw speed of 84 rpm was about 43 lbs/hr. at 1600 psi. Screw B delivered 66 lbs/hr. at 2600 psi and Screw C 49 lbs/hr. at 2900 psi. At pressures to the left of the quality limit lines, none of the screws gave the best quality. This means that with low resistance dies, some auxiliary means of increasing the pressure, preferably a valve, would be necessary to achieve maximum output. Under these conditions the deeper channel screws B and C would give higher output rates than screw A although higher pressures would be required to reach the same quality level at the higher rates. With very high resistance dies such as used for small diameter, thin-wall wire insulation which may develop pressures of 5,000 to 10,000 psi, screws A and B would give good quality without auxiliary pressure devices. Screw A, however, would begin to show an advantage, rate-wise, due to its relatively flat rate versus pressure characteristic. Screw C would be of little value for high quality production purposes since in the pressure region, where good quality can be achieved, the output rate would be comparatively low and essentially non-existent over about 3500 psi.

The drive power consumption was essentially the same for all three screws at 84 rpm. To achieve a rate of good quality product with screw A, equivalent to that possible with screw B (66 lbs/hr.), would necessitate operating screw A at 130 to 140 rpm and about a 75 per cent increase in drive power. These increases in screw speed and drive power would not be justified since the same result could be achieved more economically by increasing the channel depth of screw A to give it characteristics closer to screw B. Thus by a judicious balance of channel depth and operating pressure, it would be possible to design a screw that would give the maximum possible output of high quality product from a given extruder. This would be practical, however, only if a suitable means for controlling the pressure were included. A screw designed for maximum quality output of heavy sections (low resistance dies) would not be likely to give maximum output in high resistance (high pressure) applications.

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It is now apparent that the best possible mixing, and therefore the highest quality production, is not accomplished at low pressures even with what have normally been considered shallow channel screws. Since a substantial portion of commercial extrusion applications operate with relatively low resistance dies, an auxiliary method of raising the pressure is essential if the full inherent capacity of the extruder is to be realized. A valve between the extruder and the die provides a logical and convenient means for accomplishing pressure and quality control.

D. Application of Theory to Practice

1. Sheet Extrusion of Polyethylene and Impact Polystyrene

Once the principles of controlled pressure extrusion were successfully demonstrated with simple rod extrusion of polyethylene, attention was directed toward the application of the technique to the extrusion of commercial products. Initial studies resulted in the successful application of the technique to sheet extrusion of both polyethylene and impact polystyrene.

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Sheet extrusion was chosen for initial studies because the effect of pressure on quality could be readily observed and analyzed during extrusion. Quality was evaluated by examining sheet extruded from tumbled mixtures of natural and colored resin. Poor color dispersion and surface waviness served as indications of the non-homogeneity caused by poor mixing. Samples obtained during the studies are shown in Fig. 4, which illustrates how quality continues to improve with increasing pressures until a satisfactory product is obtained.

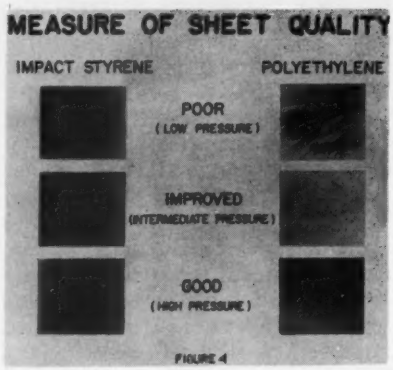


FIGURE 4

★ ★ ★

It has been established in the discussion on the theory of controlled-pressure extrusion that the improvements in quality obtained with the increased pressures possible with a valve permit operation at higher screw speeds and higher output rates. By simultaneously increasing both the screw speed and pressure, good quality can be obtained at the maximum screw speed of the machine. This is illustrated in Table 2 for two screws, a shallow and a deep channel type. Under conventional extrusion conditions on a 2½ inch extruder (no valve, 20-60-100 mesh screens), the mixing-head deep-channel screw which was specifically designed for conventional sheet extrusion produced commercially acceptable quality at 60 rpm and an output rate of only 85 lb/hr. Any further increase in screw speed resulted in quality degradation. However, with the use of a valve to develop the higher pressures necessary to maintain satisfactory quality, the screw speed was raised to the maximum of 105 rpm. This resulted in an increased output rate of 120 pounds per hour.

TABLE II
CONTROLLED-PRESSURE (VALVE) EXTRUSION
Impact Polystyrene Sheet (Bakelite TGD 5001)
2½ in. Extruder

Screw Speed (RPM)	Mixing Head Deep Channel Screw (lb/hr.)	Full Flight Shallow Channel Screw (lb/hr)
60 (Conventional Extrusion)	85	
80 (Controlled-Pressure Extrusion)	105	120
105 (Controlled-Pressure Extrusion)	120	140

★ ★ ★

With the full-flight shallow channel screw, it was not possible to obtain acceptable quality under conventional extrusion conditions at any screw speed. However, a valve made it possible to develop the higher pressures necessary to obtain satisfactory quality. By increasing the screw speed, and at the same time increasing the pressure so as to maintain good quality, it was possible to reach the maximum screw speed of 105 rpm. This resulted in an output rate of 140 pounds per hour. Thus with the controlled-pressure extrusion technique it was possible to take a screw which was not able to produce satisfactory quality under conventional conditions and to outperform a screw especially designed for sheet extrusion. Using either screw and the controlled-pressure technique, maximum power available to the extruder was not reached even at top screw speed. If higher screw speeds had been attainable it would have been possible to take advantage of the available power and improve productivity even further.

★ ★ ★

A shallow channel screw will give higher output rates at elevated pressures than a deep chan-

nel screw. This was proven in sheet extrusion (Fig. 5) where, at 105 rpm, 120 pounds per hour were obtained at 2000 psi for the deep channel screws as compared to 140 pounds per hour at 3000 psi for the shallow channel screw. It can be concluded that although controlled-pressure extrusion makes possible the production of good quality sheet at the top screw speed with either screw, a shallow channel screw is preferable.

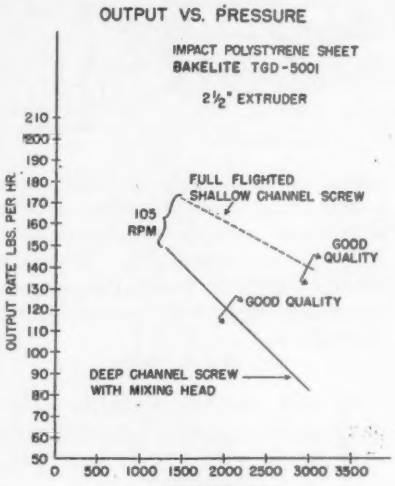


FIGURE 5

In the past, without a valve for controlling pressure, the screw had to be designed for the particular product being extruded. With a pressure controlling device, the screw design is still important to obtain the optimum in extruder performance. However, controlled pressure makes any screw more universally applicable.

★ ★ ★

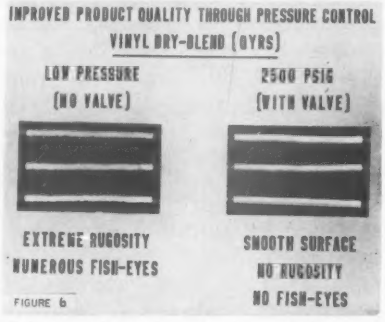
Although the results described in this section were obtained with impact polystyrene, the same trends were observed with polyethylene.

2. Extrusion of Vinyl Dry Blends

Quality problems, such as fish eyes and rugosity which are associated with the extrusion of vinyl dry blends, have in the past been serious enough to discourage many fabricators from using dry blends. Thus, the economic advantages possible with the direct extrusion of dry blends, without prior fluxing on hot-processing equipment such as Banburies or roll-mills, have never been fully realized. With controlled pressure, the quality of products extruded from dry blend formulations is comparable to or better than that obtained with conventional extrusion of hot-processed compounds.

★ ★ ★

In general, the effect of pressure on the extrusion performance of vinyl dry blends is similar to the experience with polyethylene and impact polystyrene. Fig. 6 shows the effect of pressure on quality in the extrusion of a typical wire insulation compound prepared as a dry blend mixture by using Bakelite Company's QYRS resin, DOP plasticizer, lead stabilizers and fillers. Under conventional extrusion conditions, and without a valve, any attempt to operate at high screw speeds resulted in a wire coating as shown on the left.



This product is rough and lumpy, contains unfluxed particles and fish eyes and is of overall unacceptable quality. By increasing the pressure to 2500 psi by means of a valve, the quality was improved as shown by the samples on the right. The fish eyes and rugosity have been satisfactorily eliminated and the surface finish and appearance in general improved so that the coating is of commercially acceptable quality.

★ ★ ★

The improvements in quality obtained with the higher pressures made possible by the valve, permit operation at higher screw speeds and greater output rates. This is illustrated by Fig. 7 which describes the extrusion of the same dry-blend formulation in a 1/32 inch coating on number 14 wire. Rate was plotted versus pressure for two different screw speeds.

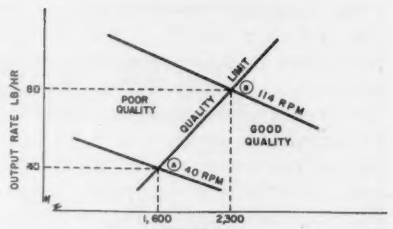


FIGURE 7
EFFECT OF PRESSURE ON OUTPUT RATE AND QUALITY
EXTRUSION OF VINYL DRY BLEND (QYRS)
1/32 INCH COATING, NO 14 WIRE

Also shown is a quality limit line which is the boundary between regions of acceptable and unacceptable quality production.

★ ★ ★

When extruding without a valve, the pressure obtained was only 1600 psi. At this pressure, the maximum screw speed which gave commercially acceptable quality was 40 rpm, (Point A). This resulted in an output rate of 40 pounds per hour. Increasing the screw speed without increasing the pressure resulted in deterioration of product quality. However, when the screw speed and pressure were increased simultaneously, as shown by line AB, good quality was maintained until reaching the maximum screw speed of which the machine was capable. In the same case shown, this was 114 rpm at 2300 psi, (Point B). This resulted in an output rate of 80 pounds per hour, or double that possible with no valve. If higher screw speeds were available, they could have been employed to result in further increases in output rate since the maximum power of the unit had not been reached.

★ ★ ★

Since wire coating is one of the principal applications of vinyl dry blends the examples given were chosen from that field. However, the principle is applicable to other contours and formulations as well.

E. Methods of Controlling Pressure

Several methods of obtaining pressure are shown in Table III.

TABLE III

Methods of Obtaining Pressure

1. Screen Pack	*3. Choker Bar
2. Fixed Orifice	4. Valve

* For sheet dies.

A common misconception in the industry today is that screen packs can be used to develop high pressures. Actually, for developing the pressures necessary to produce an acceptable product at high output rates, screen packs alone are not satisfactory in most cases. This is made clear in Fig. 8 where,

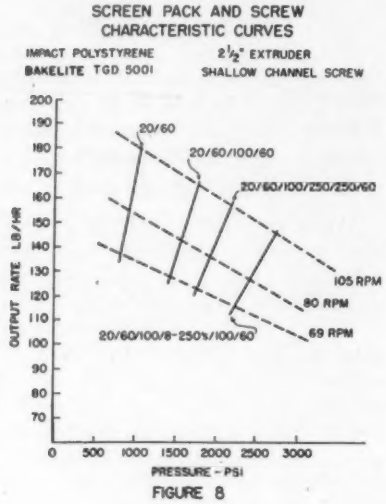


FIGURE 8

superimposed upon the screw characteristic curves for a shallow channel screw, are a series of screen pack characteristic curves. Normal screen packs, such as the 20/60 or 20/60/100 mesh, develop low pressures in the extruder. Increasing the screen pack from 20-60 mesh to the dense 20/60/100/8-250's/100/60 mesh resulted in a pressure increase of only 1600 psi at 105 rpm. For the particular screw used, the pressure generated by the dense screen pack was roughly 2500 psi, or about 500 psi short of that necessary for good quality. Even if this pressure had been obtained with a further addition of screens to the pack, such high densities would be prohibitive in production operations because clogging would necessitate frequent shut downs for screen changes.

★ ★ ★

A streamlined orifice of the required diameter can be calculated from fundamental flow equations to give the pressures necessary to improve product quality. The obvious disadvantage with this method, as with screen packs, is that the pressure obtained is fixed and is therefore satisfactory for only one set of extrusion conditions. If small changes in pressure are needed screen packs can be added to the orifice. In any case, a shut down in operations is necessary in order to change pressure.

★ ★ ★

In sheet extrusion the die generally has a choker bar which offers a rather rough method of pressure control. Screen packs can be used in conjunction with the choker bar for additional small changes in pressure.

★ ★ ★

For easy, instantaneous and continuous control of pressure, the advantages of a valving mechanism are obvious. Furthermore, one valve design can be made satisfactory for all the thermoplastic materials if the special characteristics of the most critical of these are taken into consideration. Such a consideration is the heat sensitivity of vinyls. This factor demands that the design of the valve preclude the possibility of dead spots that result in hang-up and subsequent decomposition. A survey conducted at the outset of the studies on valve extrusion, revealed that suitable valves were not commercially available. An ordinary gate valve sufficed for preliminary studies with polyethylene and impact polystyrene. However, for extensive studies, particularly with vinyls, a suitable valve had to be designed.

★ ★ ★

One Bakelite Company design which has been successfully demonstrated is shown schematically in Fig. 9. The pressure is controlled

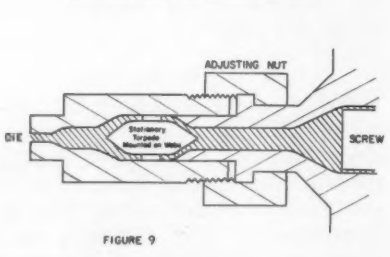


FIGURE 9

by regulating the space between the torpedo and a tapered cylinder by means of an adjusting nut. Perfect streamlining throughout, even with the webs on which the torpedo is mounted, eliminates any possibility of material hang-up.

★ ★ ★

Another Bakelite Company design which has been successfully demonstrated is shown schematically in Fig. 10. Pressure is con-

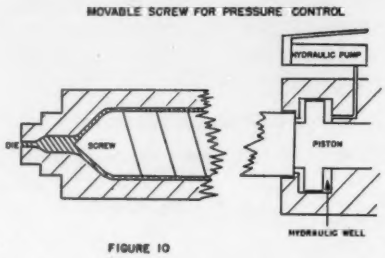


FIGURE 10

trolled by adjusting the space between the tapered nose of the screw and a tapered cylinder section of the head. The screw is moved either hydraulically or mechanically without stopping operations.

★ ★ ★

In still another Bakelite Company method, shown schematically in Fig. 11, pressure is controlled

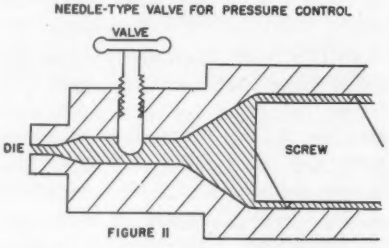


FIGURE 11

with a needle-type valve. This is probably the easiest and least expensive to build, but its design poses difficulties in streamlining.

★ ★ ★

As interest in valved extrusion spreads, extruder manufacturers will develop and improve methods of controlling pressure and eventually these methods should become standard parts of extruders.

IV. Bibliography

(1) Maddock, B. H., "Factors Affecting Quality in Polyethylene Extrusion," 13th Annual National Technical Conference of the Society of Plastics Engineers, January 16, 1957, and Modern Plastics, April, 1957.

(2) Technical Release No. 14, "Bakelike Brand Vinyl Chloride Resin-QYRS," July, 1957.

ELECTRIC WIRE & CABLE SECTION NEWS

At a meeting of the Committee on March 25, 1958, in New York City, several important decisions were arrived at, bearing upon future Association policies with respect to this Section. These were:

- The Committee will be responsible, in association with meeting program committees, for securing papers relating to electric wire and cable for the programs of the annual convention and the regional meetings.

- The Committee will organize a Papers Reviewing Committee whose job it will be to upgrade the quality of the papers and check the authority of technical information.

- The Committee is to plan subjects treated so that papers, at least in any one technical session, bear a relation, one to another.

The decisions of the Committee are to be submitted to the Association's Board of Directors for approval at the annual Spring meeting.

The Committee

Since publication of the committee membership in March, new members have been added. The complete list presently is as follows:

Hugo W. Biskeborn, Dir. of Mfg. (Chairman)
Ansonia Wire & Cable Co.
111 Martin St., Ashton, R. I.

Harold W. Adams, Prod. Supvr.
Cable Div. Reynolds Metals Co.
2500 So. 3rd St.
Louisville 1, Ky.

David Barr, Plant Eng.
National Electric Products Corp.
338 14th Street
Ambridge, Pa.

Grover W. Brown, Mgr., Machinery Development
The Okonite Co.
Passaic, N. J.

G. E. Forsberg, Vice-President
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The Crescent Co., Inc.
Front & Central Ave.
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W. R. Moyers, Chief Eng.
Wire Engineering Dept.
Western Electric Co.
P. O. Station B
Buffalo 7, N. Y.

J. C. Murray, Jr., Vice-President
Crescent Insulated Wire & Cable Co.
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Wire and Cable Div.
The Electric Auto-Lite Co.
601 Poplar St.
Hazleton, Pa.

H. S. Spaulding, Tech. Supt.
Kaiser Aluminum & Chemical Corp.
P. O. Box 671, Newark, Ohio.

Roger T. Stafford, Project Engineer
Kennecott Wire & Cable Co.
Phillipsdale (Rumford 16), R. I.

Marshall V. Yokelson, Res. Met.
General Cable Corp.
Bayonne, N. J.

Further details will be reported as they develop.

THE WIRE ASSOCIATION

RICHARD E. BROWN, *Executive Secretary*

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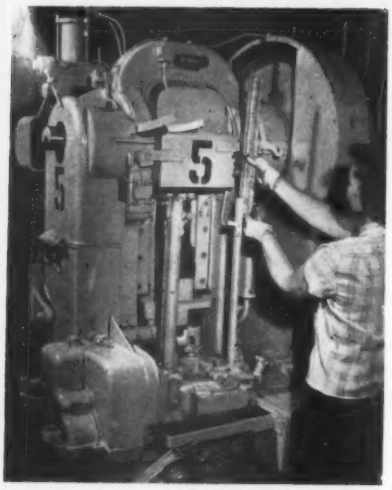
The Manufacture of Can Keys

A brief description of the process of producing so simple a product as wire keys for the opening of tin cans is detailed here as an interesting example of wire product fabrication.

The key to success in millions of western kitchens is a humble piece of steel wire known as a can key. To make milady's kitchen chores a little bit easier, **American Can Company** manufactures some 175,000,000 of these keys a year for its west coast food packing customers.



Can key blanks of .099 gauge galvanized steel wire are fed from rods into this machine which flattens each key end, pierces a slot in this portion, and forms two welding points for fastening. The dies which do this work revolve at tremendous speeds. The key blanks are racked for easy insertion into the machine. Some 175,000,000 of these keys per year are made for western consumers of canned coffee, peanuts, candy and shortening. * * * * *

Bethlehem Pacific .099 gauge galvanized steel Silver Bright Wire reels on 200 pound coils and heads into a bending machine at American Can Company's plant at 20th and Third Streets in San Francisco. This machine forms the loop on what will eventually be can keys. It is capable of producing 900 key blanks per minute. * *

Bethlehem Pacific furnishes the .099 gauge galvanized Silver Bright Wire for the manufacture of these keys. They are formed at such high speeds that uniformity of size and strength qualities of the wire are essential. Before each key is completed and welded to the can bottom, it undergoes tremendous punishment in bending, punching, and stamping operations. The zinc coating of the wire must have a tight bond to the steel so that it will not flake or chip in bending, and the wire must be strong enough so that it doesn't twist in use.

★ ★ ★

At the American Can Pacific Factory at 20th and Third Streets in San Francisco, this key wire is reeled off simultaneously from three 200 pound coils, and heads into a forming machine.

★ ★ ★

The key heads or loops are formed three at a time in this machine, at the rate of 900 per minute. The machine cuts the wires to specified lengths, while right and left forming jaws bend the wires around a mandrel to form a loop. The keys are ejected from the machine, the looped end passing onto a racking rod where they are ready for the next step in processing.

★ ★ ★

At each machine station in the process, a constant inspection of keys is maintained to assure uniform quality. At the next station, an operator feeds the rack into a stamp and punch machine which

(*Please turn to page* 699)

Key and can bottom are joined in this arc welding machine of American Can's San Francisco plant. The keys are machine fashioned from .099 gauge galvanized wire. Two points on the flattened end of each key are fastened to the can bottom by this rapid operation of arc welding. The machine welds at the rate of 150 per minute. * * * * *

Progress of the Indian Cable Industry

The Indian Cable Industry is nearly 35 years old. During the last ten years it has made a remarkable progress. There are now nine units engaged in the production of conductors. Two units manufacture both copper and aluminum conductors, four manufacture only copper conductors and three manufacture only aluminum conductors. Most of the units produce a wide range of goods apart from bare copper and aluminum conductors. Some also make cable accessories.

★ ★ ★

All concerns plan to augment production, and to develop new lines. Plans for manufacturing paper insulated power cables and for expansion of capacities for hard drawn bare copper conductors, etc. are in an advanced stage. A leading company has plans for the manufacture of copper grooved conductors and to set up a rod mill for the manufacture of electrolytic copper rods. There are some gaps in the cable industry at present. Copper-weld rods are imported from the U.S.A. High tensile galvanised steel wire is not produced in the country. One company plans to erect a plant with a capacity of 6,000 tons for the manufacture of these wires.

★ ★ ★

The principal raw materials required by the industry are:

(a) **Electrolytic Copper Wire Bars for the manufacture of the electrolytic copper rods;**

(b) **Cadmium;**

(c) **Copper-weld rods for the manufacture of Copper-weld wires.**

(d) **Electrolytic aluminium ingots/bars of rods for the manufacture of A.C.S.R. and all aluminium conductors; and**

(e) **High tensile galvanised steel wire for the manufacture of ACSR.**

★ ★ ★

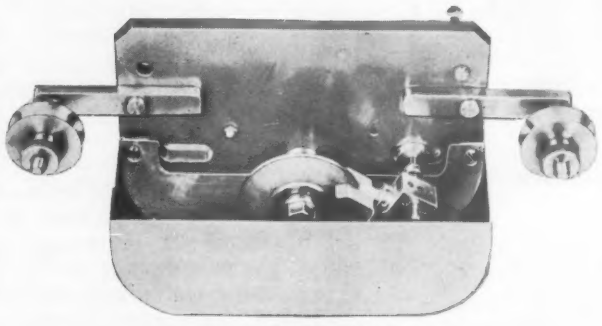
Consumable stores required are soap flakes, soft soap, rapeseed oil, mutton tallow, shell carbule grease, sulphuric tartaric and lactic acid, glycerine, graphite powder, suet, tungsten carbide and diamond dies, and rolls.

★ ★ ★

There is no indigenous manufacture of electrolytic copper wire bars, cadmium, high tensile galvanised steel wire, tungsten carbide and diamond dies, and rolls. Requirements for these materials are met by imports.

★ ★ ★

Present annual capacity of production, on single shift basis, totals 11,900 tons for bare copper conductors and 6,360 tons for all-aluminum conductors and ACSR. Most units have been working to full capacity; some work on double and triple shifts. Current demand for copper and aluminum conductors are placed at 10,000 and 15,000 tons respectively. Future demand would depend on a number of factors such as the rate of generation of electricity, completion of several multipurpose projects and relative availability of the principal raw materials. Taking into account



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3BA58

these factors, the annual demand on 1960-61 is placed at 10,000 tons for copper conductors and 20,000 tons for aluminum conductors.

New Handbook for Wire Rope Users

A new handbook is now available on the use and care of wire rope. It is written as an information piece for everyone who buys, sells or uses wire rope. The handbook contains thirty-six pages of up-to-date information, comprehensively illustrated, on points you need to know.

★ ★ ★

The book explains how to select the right rope for your specific needs; methods of socketing, splicing and installation and important points on safety. Copies may be obtained free from **Wire Rope Corporation of America,** St. Joseph, Missouri.

New Price List on Alloys

A four-page bulletin, summarizing recent price changes in the wire, rod and strip manufacturing industry, has been released for general distribution by **Techalloy Company, Inc.,** Rahns, Pa. Prepared especially for purchasing agents, bulletin lists helpful information on Monel, Nickel, Inconel, Inconel "X", Ni-Span-C and stainless steels. In addition, fringe savings now possible are shown.

★ ★ ★

Another feature of this publication is the newly expanded stock list of alloys for immediate delivery. Purchasing agents in the spring, wire cloth, nut and bolt, electronic and aircraft industries were contacted in order to make this stock list as inclusive as possible.

★ ★ ★

Used as a purchasing guide, this Techalloy bulletin shows how to save time, trouble and money in today's metal market.

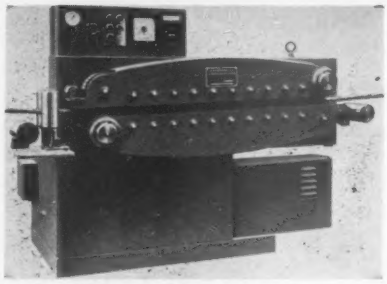
Get the habit of reading regularly
WIRE AND WIRE PRODUCTS
The Wire Man's Magazine

Larmuth & Bulmer Ltd. Adds to Line

Two new pieces of equipment have been added to the line of wire rope and cable machinery being manufactured by **Larmuth & Bulmer Ltd.**, Salford 6, Lancashire, England.

★ ★ ★

These are a caterpillar haul-off



LB Caterpillar Haul-Off. * * * * *

and an independent take-up drum stand, both equipped with automatic electric controls to simplify operation and both designed for improved mechanical efficiency at high production rates and for a versatility that adapts them to the wide variety of stranded cables being made today.

★ ★ ★

The caterpillar haul-off is useful where excessive strain can cause damage to cable sheathing and has a constancy of haul-off controllable through variator and measurable through direct visual instrument reading. Two models, Type 1000 and Type 3000 are suitable for cables with 0.20″ to 2.30″ diameters and 1″ to 4″ diameters respectively. The type numbers indicate the maximum pulling power available in pounds.

★ ★ ★

The take-up stand is made in 6 sizes to accommodate drums with flange diameters of from 29″ to 118″ in diameter. Raising and lowering the drums is effected by hydraulic jacks controlled by a simple knob. Variable torque control is used to secure a desired tension from a calibrated dial. When the production machine stops, the driving motor slips but maintains a constant pull on the cable.

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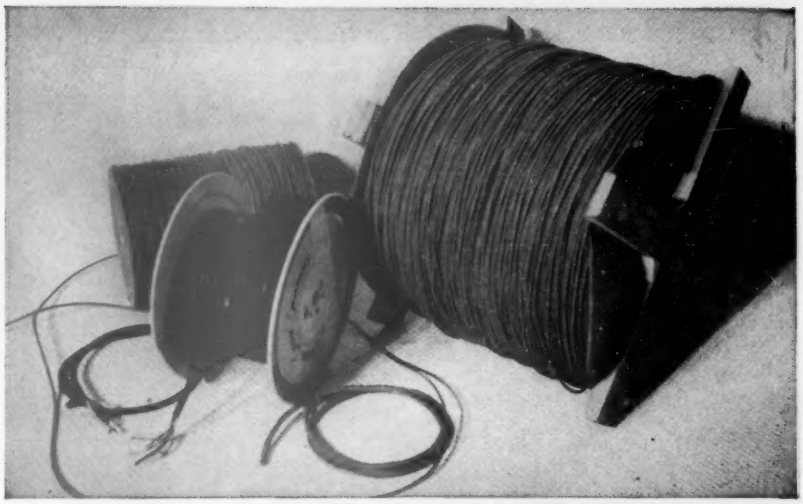

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Twitchell's superior Textilene line also includes: Fungus-resistant filler — *Twi-Tar*. Used for buried communications cable, expanded ACSR cable, and in other applications.

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Proved performance as components of cables and wires that meet government specifications . . . stability shown by trouble-free installations in continuous service 20 years and longer.

FREE — SAMPLE SPOOLS of any type of Textilene filler to demonstrate the superiority of Twitchell materials in your operation—also technical counsel without cost or obligation. Just tell Twitchell your end-use requirements. *Write, wire, or phone today:*

E.W. TWITCHELL INC.

Third and Somerset Streets, Philadelphia 33, Pa. • REgent 9-7800

PAPER PRODUCTS FOR THE WIRE INDUSTRY

Twisted • Folded • Pressed • Crushed • Shaped • Braided • Woven

We have from the beginning had but one goal in mind:

The association in your mind of Quality, Service & Reliability with the name of Apex.

The many claims which we have made for your attention over the years have always been made in the name of Apex, in our effort to avoid anonymity.

Always at Your Service!

APEX ALKALI PRODUCTS

Company

Lubricants & Cleaning Compounds for Wire and All Wire Products

Main and Rector Streets Philadelphia 27, Pa.

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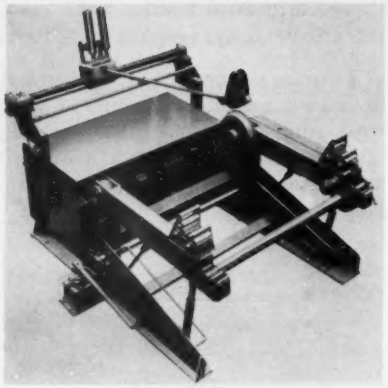


LB Take-Up Drum Stand. * * * * *

The manufacturer will be pleased to supply full details on either or both of these machines upon request.

"Alumoweld" Added by Copperweld Steel

Copperweld Steel Company has announced that, as a result of a long period of intensive research and development work in conjunction with Battelle Memorial Institute, a new product to be known as Alumoweld, an aluminum covered steel rod which can be redrawn into wire, may become an important new product of the company's Wire & Cable Division. This product is expected to lend itself to many applications in the large markets where aluminum-type conductors predominate and will be of significant interest to many of the present users of copper-covered steel wire and strand. A pilot plant was converted from an experimental line to limited production in March.

Insulates Wire for 1000°F. Temperature

Consolidated Electrodynamics Corporation, Pasadena, Calif., and **Hitemp Wires, Inc.,** Westbury, N. Y., have signed a non-exclusive 10-year agreement giving Hitemp the right to manufacture and market ceramic-coated wire using ceramicite, a ceramic-insulating material for resisting extreme heat conditions.

★ ★ ★

Ceramicite-coated wire is said

to be the first completely flexible electrical conductor that retains the principal characteristics of inflexible insulated wire. During a demonstration in Consolidated's laboratories, ceramicite-coated wire was wound around a component only twice the diameter of the wire and subjected for 1,000 hours to a continuous temperature of 1000° F. without damage to the insulation.

New Extruder Series Announced by Davis-Standard

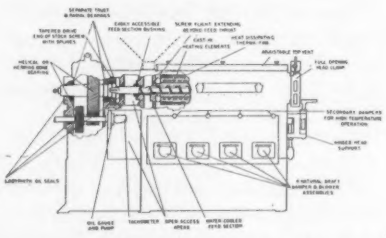
A completely new thermoplastic extruder series designed to meet the higher production requirements of the plastics and wire industries has been introduced by **Davis-Standard, Div. of Franklin Research Corp.,** 12 Water St., Mystic, Conn.

★ ★ ★

Specifically engineered to deliver higher production in each bore size, the new D-S Thermatic* Series is available in 2½", 3½", 4½", 6" and 8" models.

★ ★ ★

The Thermatic Series is completely new from head end to drive end. New helical, and in larger models, herringbone gearing plus greatly increased thrust bearing capacities enables each model to handle a large increase in horsepower over the corresponding previous model. Increased production through higher stock screw speeds are possible.



Sketch of New Thermatic Series Extruder. * *

A new 4-keyway drive end on the stock screws eliminates eccentric tendencies at high RPM and increases load-bearing capacity of the screw. The entire drive end of the stock screw is tapered

* Patented.

FOR WIRE AND CABLE INSULATION

BLACAR®

2600 AND 2700 PVC COMPOUNDS

(UL-APPROVED, COMPLETELY TESTED)

Cary Chemicals, specialists in the wire covering field, offer two outstanding PVC compounds—providing maximum processability, fast extrusion, and consistent high quality.

BLACAR® 2700:

UL-approved primary insulating material designed for low cost building wire applications—specifically: T, TW, TF, TFF, type wires (including oil exposure at 60° C).

Provides excellent processing features, high extrusion rates, good electrical properties, plus a smooth glossy finish. Ideal for use as a general-purpose material for a wide range of low-tension wires and cables.

BLACAR® 2600:

UL-approved vinyl insulation material for type T, TF, and TFF wire and cable applications.

BLACAR®

Compounds are avdilable in natural, white or black — in powder, diced or pellet form.

If your needs are special—Cary can modify existing formulations or custom-formulate to the most exacting requirements.

Write for data, working samples or technical assistance.

Cary Chemicals Inc.

P. O. BOX 1128, NEW BRUNSWICK, NEW JERSEY

Laboratory and Plant: RYDERS LANE, EAST BRUNSWICK, NEW JERSEY

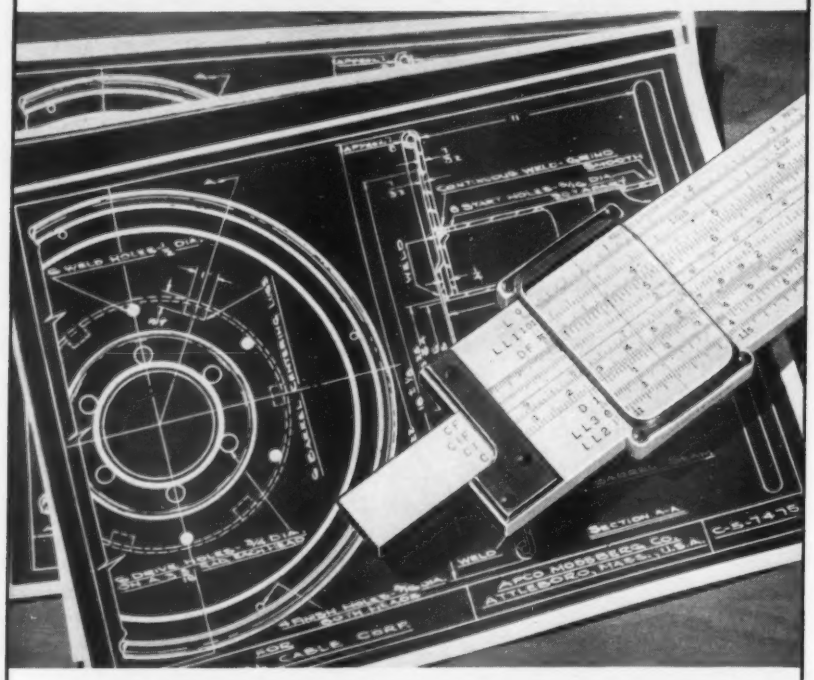
CHarter 9-8181

CARY CHEMICALS PRODUCTS:

- Vinyl Resins
- Vinyl Compounds
- Vinyl Plasticizers
- Sun Checking Waxes
- Gilsonite Compounds
- High Melting Point Synthetic Waxes

Canadian Representative: Lewis Specialties, Ltd., 18 Westminster North, Montreal 28, Que.

If you draw wire . . .



DRAW ON APCO MOSSBERG

for engineered reels, spools and bobbins

A wealth of experience — gained through more than 50 years of service to wire and wire rope manufacturers — makes Apco Mossberg well qualified to fill your complete requirements for steel reels, spools and bobbins.

The full-time staff of Apco Engineers, teamed with skilled craftsmen and modern production facilities, is ready at all times to bring you custom-made units in all sizes and designs. Their practical solutions to wire and wire rope handling problems often produce immediate and substantial production and shipping savings.

For preliminary recommendations, at no obligation, write, wire or phone Attleboro 1-0340 collect today.

Pacific Coast Representative:
Gordon Proffitt
World Trade Center
Ferry Building
San Francisco 11, California

Canadian Representative:
Hugh P. Williams & Co.
47 Colburne Street, West
Toronto, Ontario, Canada

APCO MOSSBERG COMPANY
LAMB STREET, ATTLEBORO, MASSACHUSETTS

so that it can be easily disengaged from the drive gear and removed. A unique arrangement of the feed section bearing and seal permits fast removal of the bearing for cleaning and inspection without removing the stock screw or dismantling other components. Labyrinth oil seals throughout the extruder eliminate costly replacements and shut-downs for oil seal maintenance.

★ ★ ★

The Thermatic Series employs an improved version of the D-S Therma-Fin* temperature control system. New, larger fins and heating elements in addition to new blower and damper arrangements provide precise temperature control for a complete range of thermoplastics even at maximum screw speeds.

★ ★ ★

For further details request the new Thermatic Series brochure.

Battelle and G.E. Develop Flexible Ceramic Coating

The development of flexible ceramic-coated copper wire was described by scientists participating in the annual April meeting of the American Ceramic Society in Pittsburgh. The new development, now undergoing pilot-plant evaluation, is the result of the combined research effort of ceramic specialists at **Battelle Memorial Institute,** Columbus, Ohio, and at **General Electric Company's** Fort Wayne Laboratory.

★ ★ ★

The objective in this research was to produce ceramic-coated copper wire to withstand the increasingly higher operating temperatures of electrical equipment.

★ ★ ★

To meet the demand for greater heat resistance in wire, scientists working at Battelle and General Electric developed a wire coated with a porcelain enamel. The coating is fired on the wire in a controlled-atmosphere furnace, and the wire can be produced on a continuous production-line basis.

★ ★ ★

Authors of the paper in which

these results were reported are **Dr. Burnham W. King, George D. Kelly, Jack H. Terry,** and **Winston H. Duckworth.** King, Kelly, and Duckworth are members of the Battelle Institute staff, while Terry is on General Electric's research staff in the Fort Wayne Laboratory.

New Magnet Wire Made in Canada

Federal Wire and Cable Division, Porter, Canada, is manufacturing Daglas magnet wire, a new development in the field because of its greater flexibility, superior adhesion, and resistance to surface abrasion.

★ ★ ★

Daglas magnet wire is made by wrapping bare or enamelled copper wire with a combination of Dacron and glass fibres heated to fuse the glass fibres in place. An over-all coating of standard or silicone varnish is applied to produce a smooth finish with improved abrasion resistance. The equipment used by Federal for the protection of Daglas was designed by Federal's engineers and fabricated within the plant.

★ ★ ★

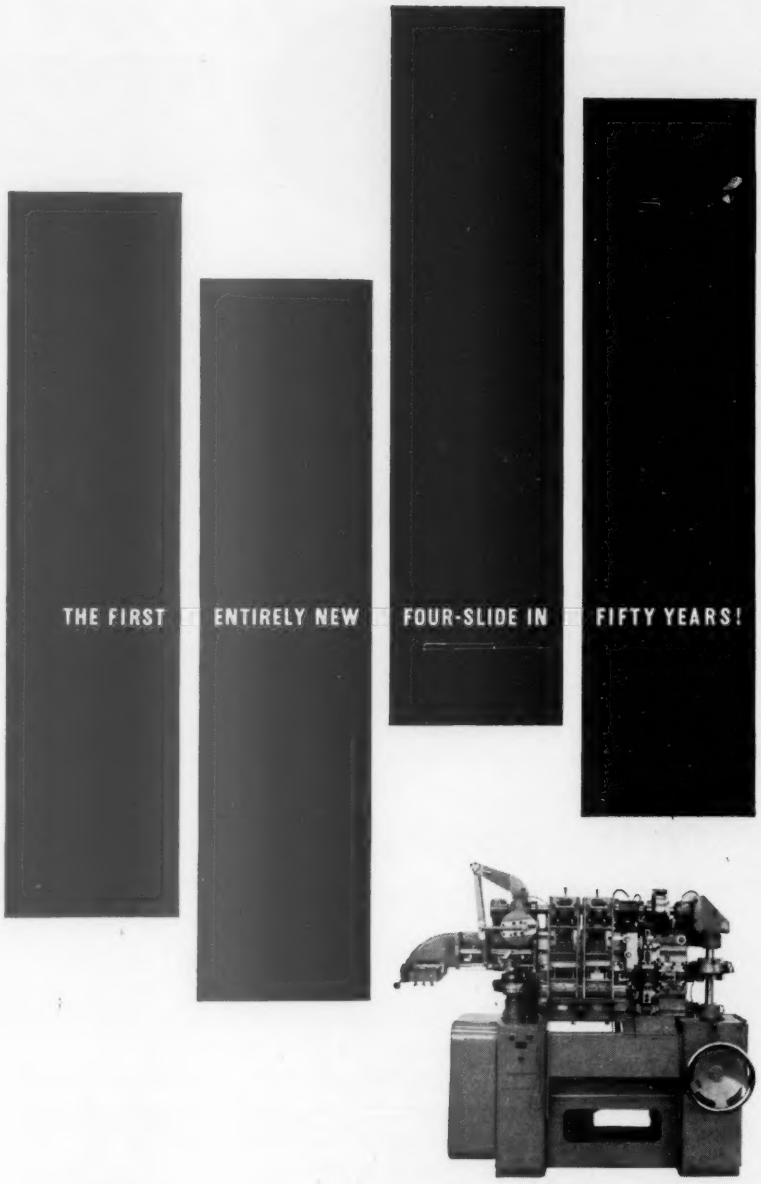
The main advantages of Daglas are increased abrasion resistance and the provision of a glass wrap to provide actual separation of the turns in case of excessive heating of the coil. Ideal applications of the wire are in starting windings of motors, in the coils of welding and battery charging and test equipment. Daglas is a **Phelps-Dodge** registered trade mark.

How to Arrange Foreign Licenses

Company executives interested in foreign licensing often find it difficult to obtain reliable information on this important phase of business. Questions concerning it are answered in a concise and practical manner in a new publication available without charge from **Pegasus International Corporation,** 1 East 53rd Street, New York 22, N. Y.

★ ★ ★

The booklet, "Foreign Licensing

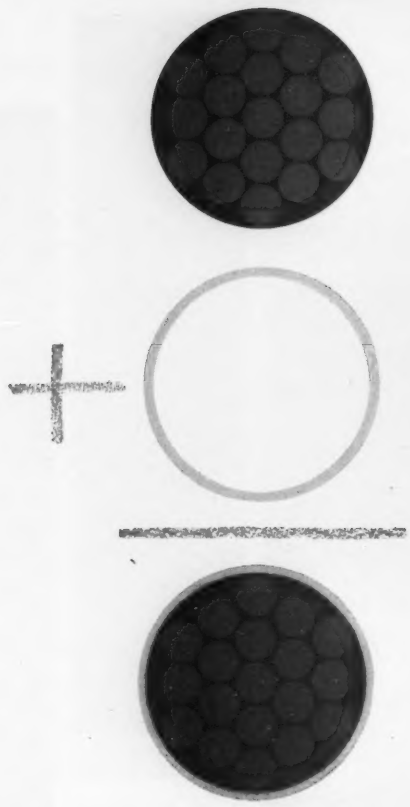


A development of industry-wide importance is the Torrington Verti-Slide—a new vertical 4-slide that is the first major innovation in the basic field of wire and strip forming equipment in half a century!

The Verti-Slide was designed to meet a serious need for greater versatility, lower tooling cost, faster set-up time and reduced floor space. We urge you to investigate the new Torrington Verti-Slide in detail.

THE TORRINGTON MANUFACTURING COMPANY

TORRINGTON, CONNECTICUT • VAN NUYS, CALIFORNIA • OAKVILLE, ONTARIO



Wire coating problem? Best solution: come to Lacquer Headquarters

Specialists in formulating and producing lacquers for the insulated wire industry, NELCO has analyzed and solved just about every conceivable application problem.

In more than 37 years, our research organization has developed countless special NELCO Lacquers. Each is designed to do a specific job, and do it supremely well.

Thus, you and your customers have the assurance that the lacquer coating is equal in quality and performance to your insulated wire and, like it, ready to meet the highest specifications.

With the NELCO data book in your file, you will have authoritative facts on a wide variety of finishes for wire and cable constructions. Write for it now, or send us information on your specific requirements.

NELCO

LACQUERS

Chemical Products Corporation

EAST PROVIDENCE, R. I.

—Questions and Answers," is designed to help the business executive gain a working knowledge of the problems of foreign licensing, and to serve as a guide in avoiding its pitfalls.

★ ★ ★

Pegasus International was organized in 1950, specifically to assist American firms in overseas business activities. The company has six major branches in London, Paris, Frankfurt, Copenhagen, Tokyo, and Melbourne.

★ ★ ★

This booklet may be obtained by writing on company letterhead to the New York office of Pegasus.

Metallic Electrical Conductors

The tremendous demand for electric power in recent years has intensified the demand for information on electrical conductors. This comprehensive, handy volume, contains all ASTM Standards in the field. It supersedes the December 1955 edition. There are 55 standards of which three are completely new and 13 are revised or have had their status recently changed.

★ ★ ★

Of particular interest to the utilities, wire and cable manufacturers, the 334 page book also contains standards of interest to the electronic and communications industry. Among the materials covered are copper, copper alloys, copper covered steel, aluminum, and galvanized steel and iron.

★ ★ ★

Copies of this book may be obtained from ASTM Headquarters, 1916 Race St., Phila. 3, Pa. at $3.75 each.

Catalog of Silicone Products

The major silicone products and some of the many uses for them are discussed in CDS-129, a new eight-page catalog now available from the **Silicone Products Department** of the **General Electric Company,** Waterford, N. Y.

★ ★ ★

Among the silicone materials for

which data and descriptions are given are rubber, fluids, resins, water repellents, electrical insulation, release agents, lubricants, paint vehicles, and anti-foam agents.

★ ★ ★

In addition to basic product and application information, CDS-129 also lists G-E literature providing detailed reports about specific silicones and their applications in the aircraft, electrical, automotive, textile, chemical, paint, polish, rubber, construction and other industries.

Booklet on Industry's Role in America

The large industrial corporation has demonstrated the "ability to bring people everywhere the technology and the gains of modern life," according to "This is Du Pont," a booklet published by the **Du Pont Company,** Wilmington 98, Del.

★ ★ ★

This 52-page booklet tells the story of industry's role in the modern American society, of which it is an inseparable element, and relates the development of industry with the growth of the nation—using the 156-year-old Du Pont Company for illustration.

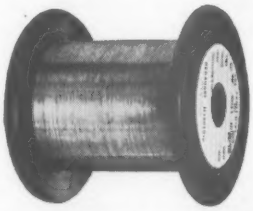
★ ★ ★

"The most conspicuous contribution of the large corporation," it points out, "has been the application of science and technology to the service of the entire U. S. population. The corporation has grown to its present stature in the past half century and, in that interval . . . the American people have attained a measure of prosperity unmatched in any other nation or era."

High Voltage Insulation Tester

Available in voltage ranges of 5KV to 150KV and in capacities from ½ to 100 KVA, a new "K" series of Test Set features: high power capacity, low waveform distortion, metering directly at High Voltage output, a trip-free circuit breaker, dual scale KV meter with means to readily re-calibrate meter

How Lestershire Bobbins save money for Wire Manufacturer and its customers



Because they take rough handling in shipment, are re-usable and weigh far less than metal bobbins, Lestershire Wire Bobbins cut costs and losses for both a magnetic wire manufacturer and its customers.

Withstand rough treatment. Extra dense Vulcanized Fibre bobbin heads prevent damage to wire or bobbins in transit. Where brittle, metal-bound wood heads chip easily, shock-absorbing Vulcanized Fibre heads resist chipping and denting. In fact, Vulcanized Fibre has *self-healing* properties; bumps "iron themselves out" to the original, smooth, hard finish.

Last indefinitely. Lestershire patented anchor screw construction gives extra ruggedness to the head-barrel joint. Added strength in materials and construction means that Lestershire Wire Bobbins wear indefinitely. You can use them over and over again—and save the cost of frequent replacements.

Save shipping charges. Vulcanized Fibre weighs less than half as much as aluminum. The light weight of Lestershire Bobbins means big savings in shipping.

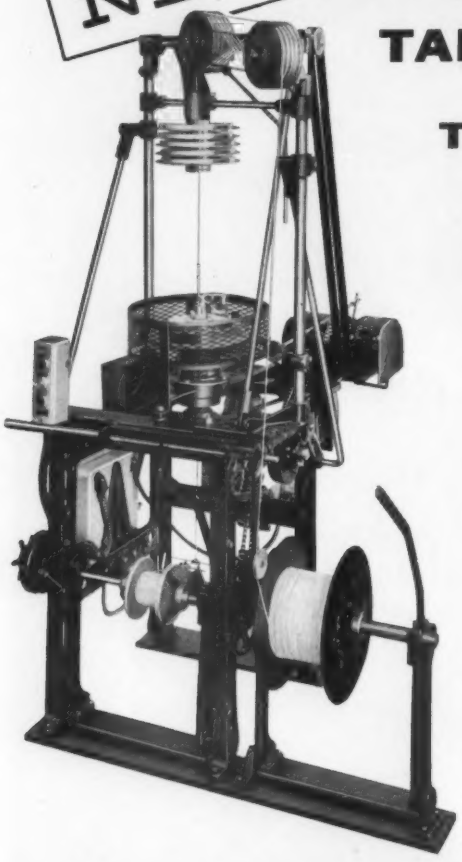
Send for free details. For full information on the Lestershire Line of Wire Bobbins, get our 12-page comprehensive Bobbin Manual. Write for your free copy direct to: Dept. GG-6.

LESTERSHIRE SPOOL DIVISION
NATIONAL VULCANIZED FIBRE CO.
WILMINGTON 99, DELAWARE • In Canada: NATIONAL FIBRE COMPANY OF CANADA, LTD., Toronto 3, Ontario

NEW **WARDWELLIAN®**

TAPE SERVER

TYPE N.T.T.



for Teflon, vinyl, and many other types of tape within specification range.

- Serving head speed adjustable from 375 RPM to 1200 RPM, dependent upon character of material.
- Maximum diameter of flexible conductor ¼".
- Takeup adjustable for any desired lay with tapes up to ½" maximum width.
- Supply package 7" maximum diameter, 3" hole.
- Rate of production dependent upon width of material and angle of lay.
- Machine equipped with "Varidrive" motor.
- Machine operation fully electrically controlled.
- Serving head mounted on heavy duty ball bearings.
- Serving head can be operated clockwise or counter-clockwise.
- Machine equipped with new type multi-groove takeup sheaves and idler pulleys insuring a uniform product.
- Improved wire payoff tension control.
- Counter furnished for measuring product in feet.
- Light windup for winding small conductors on reels 30" diameter, 13" overall width.

Complete information available on request.

276-8

WARDWELL
BRAIDING MACHINE CO.
1212 HIGH STREET
CENTRAL FALLS
RHODE ISLAND, U. S. A.
Representatives for Europe, British Colonies and Dependencies
JAMES MACKIE & SONS, LTD., BELFAST, IRELAND

ranges by screw-driver adjustable control, plus usual switches, pilot lamps, non-locking "High Voltage on" push button switch, continuously adjustable output control with zero-start interlock, and provision for external safety interlocks.

★ ★ ★

Smaller units, ½ to 2 KVA, are self-contained in portable cabinet; larger capacity Test Sets have a tanked High Voltage section in addition to the control section shown.

★ ★ ★

For further details, write Peschel Electronics, Inc., Towners, Patterson, N. Y.

Offers Reprint on Cold Heading Copper Alloys

John Hassall, Inc., Westbury, N.Y. offers a reprint of a technical article entitled, "Cold Heading Copper for Economy." Containing five photographs and two line drawings, the article reviews five advantages of cold heading, tells how cold headed parts are made, and discusses selection of cold heading materials.

★ ★ ★

The article includes information on solid and open die heading and four ways in which heads may be formed. A list of eight copper alloys provides a guide for selecting the right one to use.

★ ★ ★

Also covered are multiple blow heading, extrusion, trimming, roll threading, and secondary operations such as fluting, knurling, drilling, tapping, milling, etc.

★ ★ ★

Copies of the reprint may be obtained from John Hassall, Inc., Westbury, N. Y.

You Are Invited To Join

THE WIRE ASSOCIATION

Send for booklet describing its activities and a membership application card.

453 Main St. Stamford, Conn.

Outstanding Personalities of the Wire Industry

Morgan Construction Company Announces Personnel Changes

The Morgan Construction Company of Worcester, Massachusetts, has announced the retirement of **P. Alden Beaman,** Manager of the Wire Machinery Division after an association of thirty years. Mr. Beaman had been manager of the Wire Machinery Department for twenty-six years. Promoted to the post of Manager of the Wire Machinery Division is **Roger M. Scott** who was assistant manager of the division since 1948. Mr. Scott, a Brown Engineering graduate, has spent his entire business career in the wire machinery field. Prior coming to Worcester and the Morgan Construction Company he held various positions during a twenty-year employment at the N. E. Butt Company of Providence, Rhode Island. It was also announced by Morgan that **Maurice J. Knott** of Providence, R. I.,

P. Alden Beaman Roger M. Scott

has been added to the staff of the Wire Machinery Division as Machine Designer. Mr. Beaman is a charter member of The Wire Association and Mr. Scott has been a member since 1943.

Heads Kaiser Electrical Engineering Branch

Alexander N. Shealy has been appointed head of the Electrical Engineering Branch of **Kaiser Aluminum & Chemical Corporation's** Department of Metallurgical Research at Spokane, Washington. He succeeds **Dr. Eugene W. Greenfield,** who resigned on June 1, to become director of the Division of Industrial Research of the Institute of Technology of the State College of Washington.

★ ★ ★

Mr. Shealy joined Kaiser Aluminum in 1955, with the particular assignment of expanding and directing research in the extra high voltage field. For the past year he has also served as assistant head of the Electrical Engineering Branch of the Research Department. He is an electrical engineering graduate of Clemson College.

Expands Sales Organization

Inso Products, Ltd., manufacturers of the exclusive "Fused-Film" Teflon wire and cable now

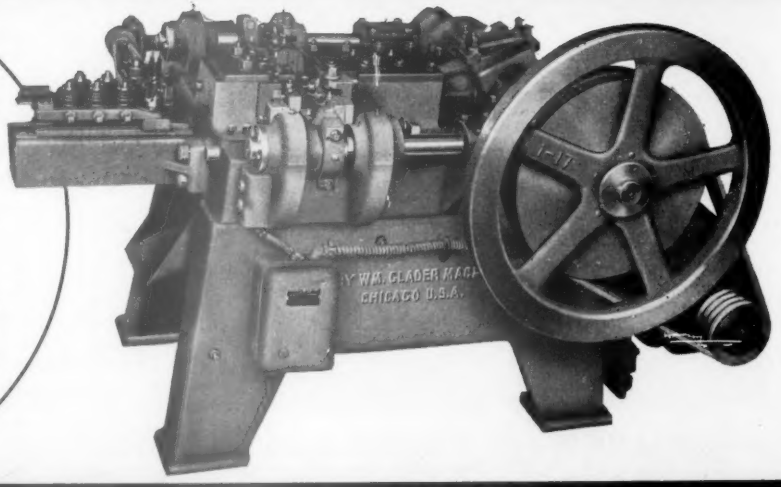
GLADER

HIGH SPEED WIRE NAIL MACHINES

HIGH TONNAGE OUTPUT—LOW MAINTENANCE COST

You can take care of increased production schedules and better product demands with these machines of established reputation.

For 55 years GLADER MACHINES have been giving HIGH QUALITY, LOW COST nail production.



Wm. Glader Machine Works 210 N. Racine Avenue Chicago 7, Illinois

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

being used for miniaturization throughout the electronic industry, has appointed sales representatives in 17 major U. S. geographic areas, according to a statement by **Jerome Cohn,** general manager.

★ ★ ★

The company produces guaranteed pin-hole free, 4- and 6-mil wall magnet and hook-up wire, passing all MIL spec tests for conventional 8 to 12 mil wall Type "E", with lengths beyond a thousand feet. The appointment of 17 new sales representatives is a start in their effort to service all industries requiring magnet, hook-up wire and cable with the space-saving characteristics of the "Fused-Film" Teflon wire, which provides a space-saving advantage of as much as 100 per cent and a weight-saving advantage of as much as 35 per cent.

J & L Advances Beeghly

Charles M. Beeghly became Executive Vice President of **Jones & Laughlin Steel Corporation** on April 1, 1958, it has been announced by **Avery C. Adams,** President.

★ ★ ★

He has been a director since October 31, of last year. He was Vice President of the Cold Metal Products Company, Youngstown, and, when J & L acquired it in 1957, was elected President, the unit becoming J & L's Strip Steel Division.

Made Sales Manager of Reynolds Wire

Reynolds Wire Division of **National-Standard Company,** Dixon, Ill., has announced the appointment of **Frank E. Bastian** as sales manager.

★ ★ ★

Prior to joining Reynolds' sales staff five and one half years ago, Mr. Bastian was with the American Sterilizer Company, Erie, Pa. He is a native of Shreveport, La., and attended Wright Junior College in Chicago.

Elgin Appoints Sales Engineer

The Abrasives Division of the **Elgin National Watch Company** announces the appointment of **Ralph B. Peek,** as sales engineer in the Philadelphia, Pa., and Baltimore, Md., area, to provide increased engineering service for customers. His address is 16 S. Broad St., Philadelphia.

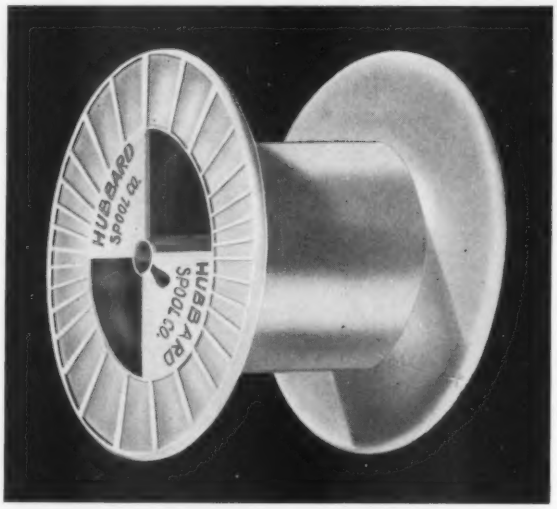
Chase Brass Announces Sales Staff Promotions

Charles W. Baker of Los Angeles, Calif., has been promoted to Assistant General Sales Manager for **Chase Brass & Copper Co.,** according to an announcement from **Walter E. Evans,** General Sales Manager. Mr. Baker, who had been Western Regional Manager, will continue to make his headquarters in Los Angeles.

★ ★ ★

Replacing him as Western Regional Manager is **Allan R. Armstrong,** promoted from Staff Manager—Tube. His headquarters will

NEWLY DEVELOPED NON-RETURNABLE PLASTIC SHIPPING SPOOLS FOR MAGNET WIRE



DESIGNED FOR:

LIGHT WEIGHT • LOW FREIGHT COSTS • LOW INITIAL COST • HIGH STRENGTH WITH DIMENSIONAL ACCURACY AND RIGIDITY FOR SUPERIOR WINDING OF WIRE IN FINE GAUGES.

DESIGNED TO MEET YOUR CUSTOMER REQUIREMENTS FOR A NON-RETURNABLE—NO DEPOSIT CHARGE SPOOL FOR ALL TYPES OF WIRE!

MANUFACTURERS OF A COMPLETE LINE OF SPOOLS AND REELS — ALL CONSTRUCTIONS

HUBBARD SPOOL DIVISION
The American Pulley Company

TELEPHONE: GARRETT 840 GARRETT, INDIANA

be in San Francisco. Mr. Armstrong's assistant staff manager **Robert H. Chittim,** has been promoted to Staff Manager—Tube, and will work out of the main office in Waterbury, Conn.

District Sales Appointments Announced

Five district sales office appointments have been announced by **Frank H. Conant,** General Sales Manager of **Riverside-Alloy Metal Division, H. K. Porter Company.**

★ ★ ★

Loy Collingwood, formerly in Cleveland, was appointed Midwest Regional Manager, with offices at 32500 Grand River Avenue, Farmington, Mich.; **Charles E. Phayre** was named New York District Manager, with offices in East Orange, N. J.; **Robert Clark** was named Assistant District Manager in New York; **Richard Quinn,** was appointed Assistant District Manager in Hartford, Conn.; and **John L. Hoffman** was transferred from New York to the Cleveland office.

Universal-Cyclops Elects Officers

The board of directors of **Universal-Cyclops Steel Corporation** has re-elected **William G. Stewart** president and **Donald W. Frease** chairman of the board. He is president of Empire-Reeves Steel Corporation, a wholly-owned subsidiary. Mr. Frease was a vice president of Universal-Cyclops. He succeeds Edward L. Stockdale, who was named honorary chairman of the board. Mr. Stockdale has been associated with the company since 1914, served as president from 1947 to 1956, and has been chairman since 1947.

Amchem Appoints Representative

The Amchem Products, Inc., Amber, Pa., announces the appointment of **Richard F. Hurley** as technical sales representatives for their metal-working chemicals division. He will be attached to the St. Joseph, Missouri office and his area of activity will include Iowa, Minnesota, North and South Dakota, Colorado and Nebraska.

Nopco Elects Swanson to Board

Nopco Chemical Company announces the election of Vice President **Harold A. Swanson** to its Board of Directors. Mr. Swanson is in charge of Sales and Laboratories of the company's Industrial and Fine Chemical Divisions.

★ ★ ★

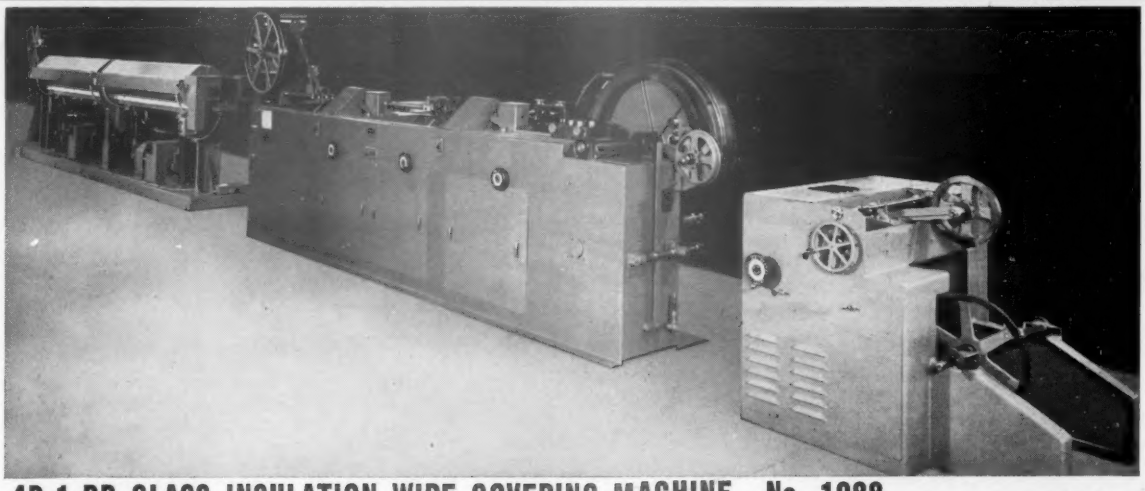
A chemical engineer and lawyer with degrees from both Northeastern and George Washington Universities, Mr. Swanson has been with Nopco 21 years.

★ ★ ★

The company, which recently celebrated its 50th Anniversary, is a major producer of industrial processing chemicals and urethane foamed plastics.

Reinforcement Institute Elects Officers

Earl C. Planett, president and owner of the **Planett Manufacturing Company,** Downey, California,

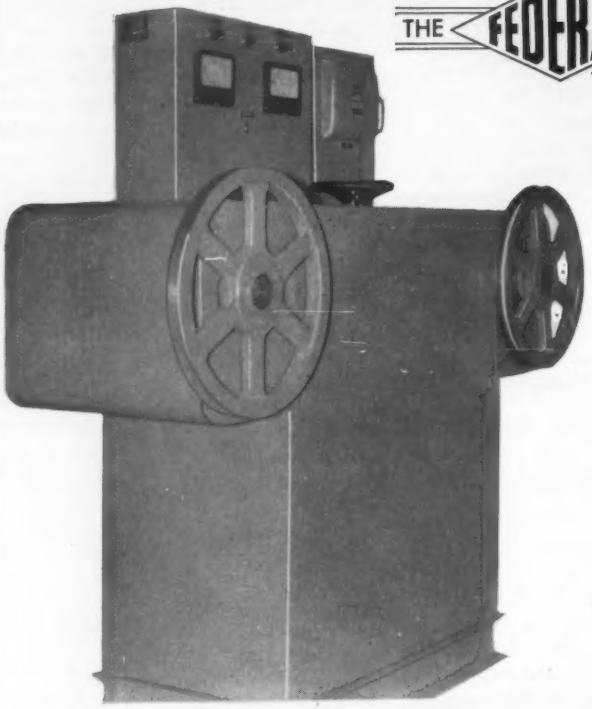


4D-1-BB GLASS INSULATION WIRE COVERING MACHINE No. 1088 Patented Aug. 3, 1943

WITH VARIABLE SPEED DRIVE.
TORQUE MOTOR DRIVEN TAKE-UP REEL STAND
BALL AND ROLLER BEARING MOUNTED
BAKING OVEN WITH DOUBLE VARNISH APPLICATOR
AND AUTOMATIC TEMPERATURE CONTROLS.

WIRE DRAWING, ENAMELING, TINNING, INSULATING,
TAPING, GLASS-COVERING, PANNING AND ALLIED MACHINERY

EST. 1855 AIMCO INC. 1915
"American" INSULATING MACHINERY COMPANY
REG. U.S. PAT. OFF.
FAIRHILL AND HUNTINGDON STREETS
PHILADELPHIA 33 PENNSYLVANIA U.S.A.



THE FEDERAL MANUFACTURING CO. WALLINGFORD, CONN.

WIRE MACHINERY • TESTING EQUIPMENT

WIRE PREHEATER

by

FEDERAL

Made in four popular Models:
3, 5, 10 and 15 KW.

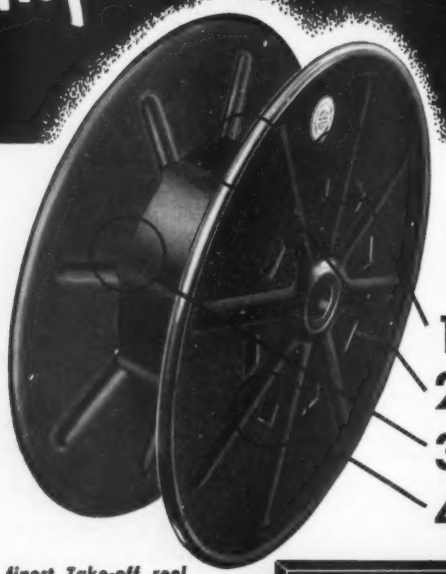
With a FEDERAL Preheater there is less wire drag.

No burning of wire when starting or stopping.

Write for details and prices.

Important DIFFERENCES

BETWEEN JUST ANY REEL AND *All Welded* MPS



TAKE-OFF REELS

Three important differences that mean longer reel life in both processing and handling of all types of insulated wires in your plant.

1. **New MPS deep wide, straight type embossed radial rib** adds considerable strength to reel heads over the old style narrow tapered rib.
2. **Increased height of the curled edge** adds even more strength and rigidity, especially to the rims.
3. Furnished with **rib fillers** that are projections on the end of the barrels that fit into the embossed radial ribs thereby **eliminating any marking of the plastic or rubber insulated wires** at the junction of head-barrel.
4. Finally, the **all welded "J" type construction** of the entire reel completes the picture.

The finest Take-off reel you can buy.
We invite your inquiries — let us tell you more about MPS Take-off Reels. Write us today.

Mossberg PRESSED STEEL Corporation

"Division of Wanskuck Co."
18 West Street — Attleboro
Massachusetts U. S. A.
Telephone Attleboro 1-0848
#109

has been named president of the **Wire Reinforcement Institute, Inc. Ford P. Schusler,** Sales Manager, Industrial Division, **Keystone Steel and Wire Company,** Peoria, Illinois, was named vice president. The two men were elected to office at the recent annual meeting of the national trade association of welded wire fabric manufacturers at Boca Raton, Florida.

★ ★ ★

Mr. Planett has been in the steel business since 1922. Born and schooled in Chicago, he moved to the west coast where he was first employed by Bethlehem Steel. In 1922 he went into the general wire manufacturing business for himself, and in 1934 designed his own machinery to make welded wire reinforcing fabric.

Orban Appoints Western Representative

Jessen & Gundry, 1633 N. W. 21st Avenue, Portland, Ore., have been appointed exclusive sales representatives in Oregon, Washington, Idaho and Montana, for the complete line of steel and wire products imported by **Kurt Orban Company, Inc.,** Jersey City, N. J., it was announced by **Kurt Orban,** president.

ACP Changes Name

The American Chemical Paint Company, Ambler, Pa., has announced that its corporate name has been changed officially to **Amchem Products, Inc.**

★ ★ ★

Since the company was founded 44 years ago, its activities have been expanded and its products diversified in the field of chemicals, whereas it no longer manufactures paint of any kind. Personnel and company policies will not be affected in any way.

AISE to Hold Convention

September 23-26, the **Association of Iron and Steel Engineers** will hold its 1958 Iron and Steel Exposition and Convention in the Cleveland Auditorium.

★ ★ ★

For information, address **T. J. Ess,** managing Director, or **William C. Friesel,** Exposition manager, 1010 Empire Building, Pittsburgh 22, Pa.

Frank H. Adams

Frank H. Adams, President of **Surface Combustion Corporation,** Toledo, Ohio, passed away April 6, 1958.

★ ★ ★

He was born in Lamar, Mo., March 28, 1886, and graduated from the University of Missouri with a degree in civil engineering in 1908. In 1912 he started his career as project engineer in the Henry L. Doherty organization. In 1924 Doherty bought Surface Combustion and Mr. Adams was appointed Treasurer. He became Vice President and General Manager in 1926 and was made President in 1941.

(*Please turn to page* 707)

ROLLER BEARING

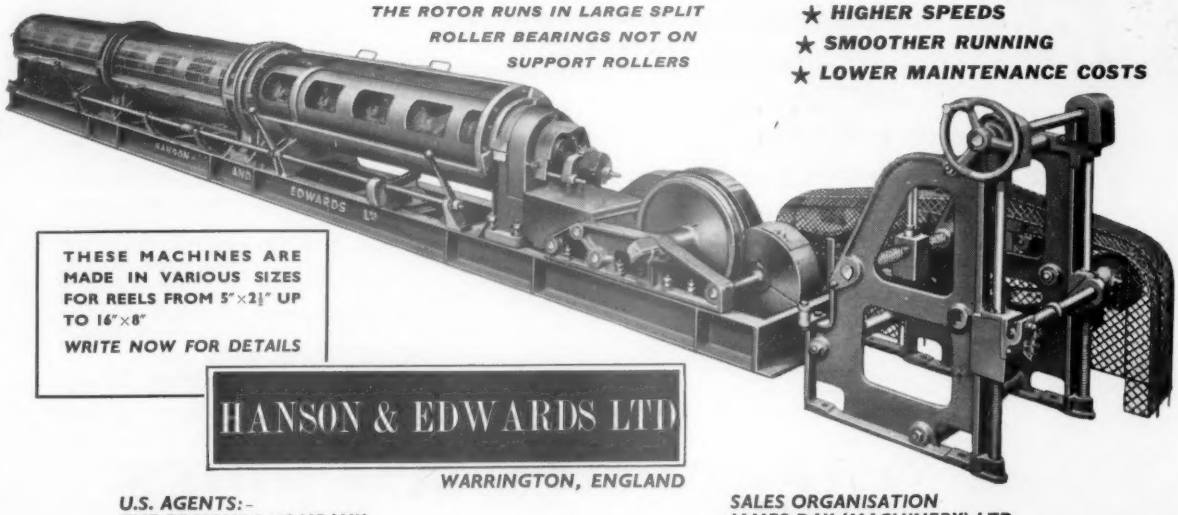
TYPE TUBULAR

STRANDING MACHINE

(EITHER SINGLE OR DOUBLE CAPSTAN)

THE ROTOR RUNS IN LARGE SPLIT ROLLER BEARINGS NOT ON SUPPORT ROLLERS

★ *HIGHER SPEEDS*
★ *SMOOTHER RUNNING*
★ *LOWER MAINTENANCE COSTS*



THESE MACHINES ARE MADE IN VARIOUS SIZES FOR REELS FROM 5"×2½" UP TO 16"×8"
WRITE NOW FOR DETAILS

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P 1686

THE PICTURE IS CHANGING

OUR "PLASTISPOOL" FAMILY IS GROWING---

TWO NEW SIZES are now in production . . . with more on the way. "PLASTISPOOLS" now offer you the widest range of capacities, colors and plastic materials available today. Whether you need a light, inexpensive package or a heavy, rugged one, Boonton's "PLASTISPOOLS" will meet your requirements. Designed specifically for the fine wire manufacturer to eliminate costly production slowdowns caused by wire catching and breaking on nicks, ridges and seams so often found on other spools. Write or phone us collect now to see how easily these new perfectly engineered Boonton "PLASTISPOOLS" can change your plant picture.

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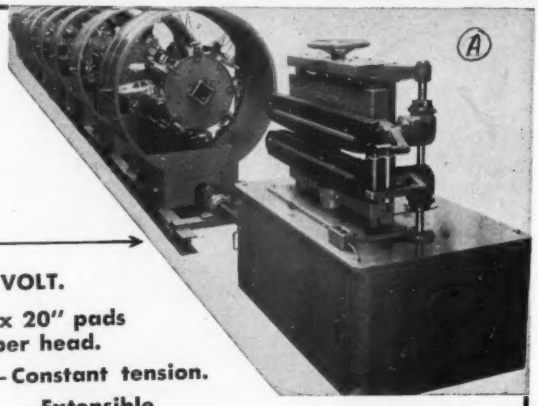
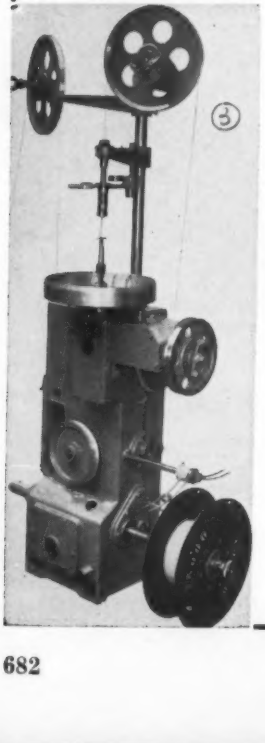
BOONTON, NEW JERSEY TELEPHONE DEerfield 4-4400

NEW...
IN PAPER LAPPING





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- — High speed paper lapping.
- — 3,000 r.p.m.
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- — Automatic stop.
- — 12" pad.
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- — Central lubrication.

FOR HI. VOLT.
- — 8 x 20" pads per head.
- — Constant tension.
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- — Individually braked.
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- — Caterpillar haul-off.
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- — Automatic stop.

POURTIER MACHINES
153, rue Général Gallieni
ROMAINVILLE (Seine) FRANCE

A Review of Recent Wire Patents

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.

Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50c for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.

No. 2,828,777, WIRE FORMING FIXTURE, patented April 1, 1958 by Gerard A. Frank, Allentown, Pa., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

Complex bends in wire may be made by this machine which includes forming members, a reciprocating actuator block and individual cams on the block for spreading each of the forming members apart for receiving wire therebetween when the block moves in one direction and for releasing the members in a desired sequence to form the bends when the block moves in the opposite direction.

★ ★ ★

No. 2,828,793, WIRE CAGE FORMING DEVICES, patented April 1, 1958 by Donald R. Wygle, Las Animas, Colo.

More specifically the device is for forming a wire length into rectangular convolutions. There are six claims.

★ ★ ★

No. 2,828,928, STORAGE RACK AND WIRE DISPENSER, patented April 1, 1958 by Frank Kollisch, Bronx, N. Y.

The rack is adapted to rotatably support a number of wire coil reels, with brakes for the reels. The guides are in the nature of tubular ducts.

★ ★ ★

No. 2,829,387, AUTOMATIC SCREW SLOTTING AND DEBURRING MACHINE, patented April 8, 1958 by William Carangelo, Pawtucket, R. I., assignor to Pawtucket Screw Co., a corporation of Rhode Island.

A rotatable carrier for the screw blanks is provided, with the latter arranged radially and their head portions outwardly disposed, and the head portions brought into operation with a lock block and a slot cutter, after which each of the slotted blanks is rotated slightly more than 90° so as to contact a deburring element.

★ ★ ★

No. 2,829,388, METHOD AND APPARATUS FOR MAKING NAILS FROM WIRE STOCK DURING CONTINUOUS ADVANCE OF SAID WIRE STOCK, patented April 8, 1958 by Michael Dzama, Maple Heights, Ohio.

The method consists of clamping wire while moving it in a lengthwise direction and cutting off a nail length, and continuing the clamping and movement of the wire in the same lengthwise direction against an abutment to head the cut-off end of the wire, and thereafter releasing the clamping of the headed wire and feeding it to nail length ready for another cutting off step.

★ ★ ★

No. 2,829,519, SPRING TESTER, patented April 8, 1958 by Harvey P. Rockwell, Jr., Indianapolis, Ind.

This is an electro-mechanical device for checking force required for unit deflection of a spring.

★ ★ ★

No. 2,829,650, WIRE SUPPORTED BRASSIERE, patented April 8, 1958 by Anthony Guide, Raritan, N. J.

The wire portions comprise a pair of generally semicircular wire sections secured together in non-rotatable relationship and held against separation by relative lateral movement.

★ ★ ★

No. 2,829,681, WIRE TWISTING MACHINE, patented April 8, 1958 by James H. Wadsworth, Bellemore, N. Y.

More specifically, this is a machine for twisting wires, of the wire strands type, from which the insulation has been removed from the ends thereof.

★ ★ ★

New! Improved! Fast!
WELLS STRAIGHTENER & CUTTER

S & C machines for small diam. wires Speed: Approx. 115 F.P.M.

This completely redesigned line combines maximum efficiency with that rugged dependability, for which WELLS S&C machines have become justly famous.

Built in several sizes to handle 2 to 18 ga. basic and high carbon wire.

FEATURES

The guide bar of these new machines can be supplied for any cut lengths • The rotary flier runs on ball bearings for smoothness and long life • Cut-off is actuated by a solenoid for extreme accuracy of cut lengths • A two point cam construction provides a quick and positive return of the cut-off knife, eliminating the need for a clutch and dog • A counter is standard equipment.

A COMPLETE RANGE OF S & C MACHINES IS MADE BY WELLS FOR ALL SIZES OF WIRE. SEND FOR CATALOG ON THE COMPLETE LINE.

Frank L. Wells Company

Builders of Fine Wire Working Machinery

5821 FIFTH AVENUE • KENOSHA, WISCONSIN

No. 2,829,706, SPRING SEAT CONSTRUCTION, patented April 8, 1958 by George M. Markle, Grand Rapids, Mich.

The construction includes a series of wire spring units centering around wire coils disposed with their axes horizontal. It is stated that the construction provides an unusual amount of resilience for a given unit height.

★ ★ ★

No. 2,829,810, CLOTHES HANGER, patented April 8, 1958 by John M. Wilson, San Diego, Calif.

A wire hanger is provided and said to support garments in wrinkle-free positions.

★ ★ ★

No. 2,829,845, COIL WINDING APPARATUS, patented April 8, 1958 by James P. Loop, Kokomo, Ind., assignor to Continental Steel Corporation, Kokomo, Ind., a corporation of Indiana.

A wire coil winding apparatus is disclosed including two spool coil-halves mounted to provide an interlocked assembled spool for winding wire thereon or to separate for the purpose of removing the wound coil.

★ ★ ★

No. 2,830,625, APPARATUS FOR CUTTING AND FORMING WIRE, patented April 15, 1958 by Robert R. Gasper and Raymond A. Greener, Clarendon Hills, Ill., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

The apparatus is for cutting and bending lead wires of electrical components.

★ ★ ★

No. 2,830,654, WIRE SPRING STRUCTURE, patented April 15, 1958 by William H. Neely, Cleveland, Ohio, assignor to the Universal Wire Spring Company, Bedford, Ohio, a corporation of Ohio.

A spring structure of sinuously-corrugated wire forming springs is disclosed with a cantilever-like arrangement attached thereto.

★ ★ ★

No. 2,831,050, CREPE PAPER INSULATION, patented April 15, 1958 by Leo Mulligan, Dalton, Mass., assignor to General Electric Company, a corporation of New York.

The insulation is adapted for flexible electric wire cables and comprises a number of axially continuous layers of crepe paper having crepe lines encircling the tube about the wire cable in planes which are perpendicular to the axis of the tube, the innermost and intermost layers being bonded to its adjacent layer by an adhesive.

★ ★ ★

No. 2,831,309, STRAND REWINDING APPARATUS, patented April 22, 1958 by Wolf Berthold, Andover, Mass., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

An apparatus for unwinding a strand from a non-rotating supply reel and winding the strand free of twist on a non-rotating takeup reel.

★ ★ ★

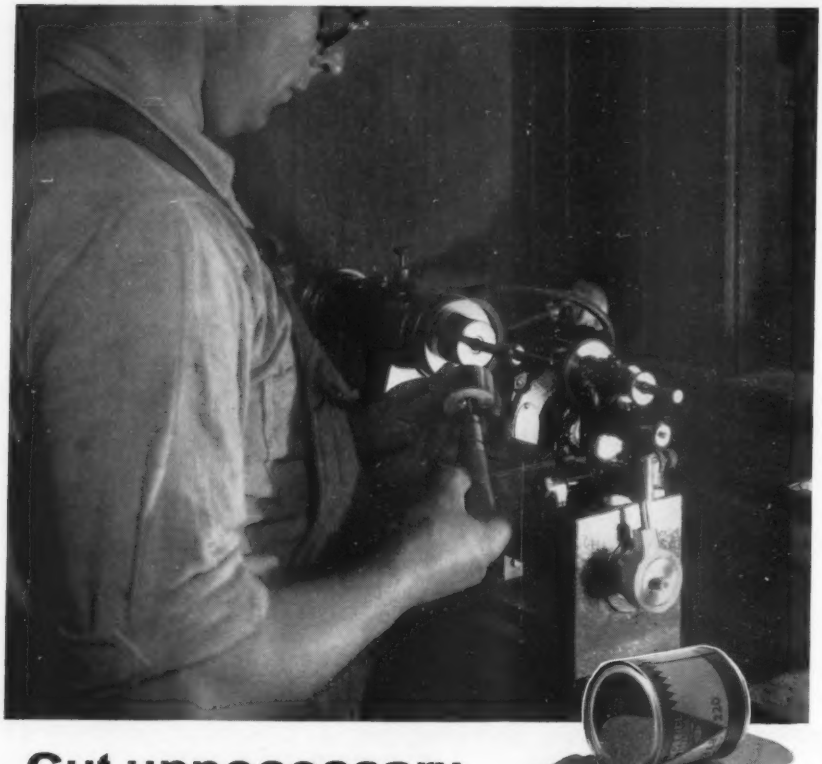
No. 2,831,310, STRAND REELING APPARATUS, patented April 22, 1958 by Wolf Berthold, Andover, Mass., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

The assembly includes a winding flyer introducing twists in the strands wound on a takeup reel, and a device responsive to the flyers to remove from the strands the twists introduced by the flyers and introduce uniform twists of predetermined twist length and direction in the strands. Patent 2,831,311 is also related to the present one.

★ ★ ★

No. 2,831,570, WIRE COILING MACHINE HAVING CAMS FOR HOLDING THE FEED ROLLS SEPARATED, patented April 22, 1958 by Wilbur Conrad, Unionville, Conn., assignor to Sleeper & Hartley, Inc., Worcester, Mass., a corporation of Massachusetts.

A wire coiling machine is disclosed having coiling tools comprising a radially movable feed roll and a roll cooperating therewith which are arranged to grip a wire therebetween and feed it to the tools, there being a device to shift a follower and lifting cams relatively to cause the lifting and lowering of the movable feed roll.



Cut unnecessary die refinishing costs

Next to diamonds and diamond dust NORBIDE* grain is the hardest manufactured abrasive commercially available. It costs 500 times less than sized commercial diamonds, bringing steady savings to refinishing operations on wire drawing dies — including ripping, semi-finishing, and, often, finishing. It will pay you to investigate the savings from NORBIDE abrasive. For details and prices write NORTON COMPANY, 45 New Bond St., Worcester 6, Massachusetts. G-350

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Our Advertisers are Reliable.
Patronize Them.

New Dead Blocks for Drawing and Galvanizing

Whitacre Engineering and Manufacturing Co., 1512 W. Commonwealth Ave., Alhambra, Calif., has issued a bulletin describing and illustrating a line of dead blocks for wire drawing and galvanizing.

★ ★ ★

These dead blocks are designed to increase production and reduce operating costs. They require less floor space than conventional take-ups, do not have to be stopped for stripping, eliminate tangling or snarling, and allow packaging into stationary containers or uninterrupted palletizing on stems.

★ ★ ★

The equipment represents a low capital investment and requires practically no maintenance. A copy of the bulletin with further details will be mailed upon request by the manufacturer.

Selecting Stainless Alloys for Springs

Stainless steel springs are found in devices as diverse as telephones and long range rockets. Designers are familiar with general properties of the stainless alloy family and almost automatically turn to it when a component needs a spring with high corrosion resistance.

★ ★ ★

According to engineers of **National-Standard Company,** a leading supplier of all types of spring metals, all eight of the common types of stainless should be carefully considered before selecting a specific one for any given application, since stainless analyses with slightly modified formulas have differing physical qualities.

★ ★ ★

Each spring application must be studied carefully. National-Standard engineers will be glad to cooperate with spring manufacturers or users to make a proper selection of the correct stainless grade for a specific application.

Acid Resistant Chains

An informative and information packed 2-page data sheet, DH-169, covering ACCO X-weld Acid Pickle Chain and X-Weld Type 321 Stainless Steel Chain, has been prepared by the **American Chain Division, American Chain & Cable Company, Inc.,** York, Pa.

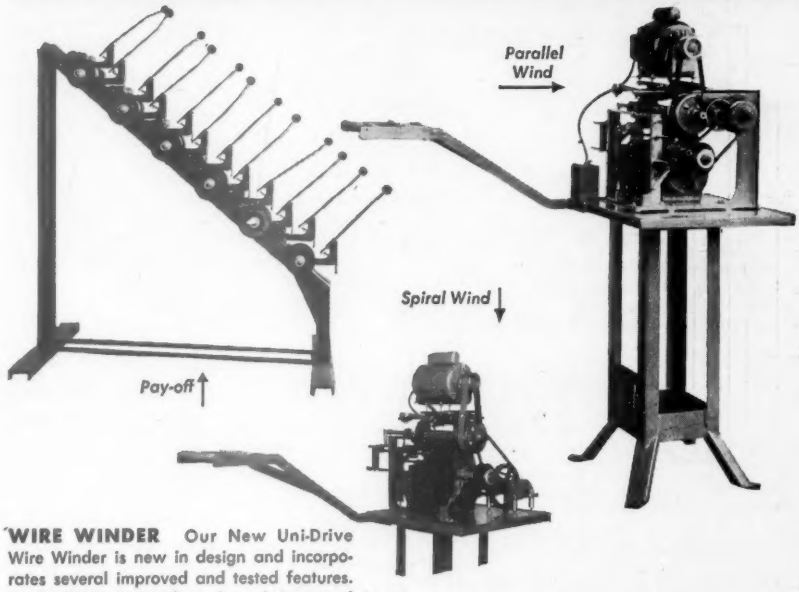
★ ★ ★

These high strength chains are designed to provide optimum service in high temperature applications and also solutions of sulphuric or nitric acids as used in industrial acid pickling operations. Working load limits, high temperature properties, physical dimensions and weights, all of interest to operating and maintenance personnel, are included.

New Aluminum Conductor

All-Aluminum Alloy Conductor —AAAC—is now being made available for general commercial use by **Kaiser Aluminum & Chemical Sales, Inc.,** 919 N. Michigan Ave., Chicago 11, Ill., after three years of laboratory and field testing in coastal and inland locations throughout the nation.

STANDARD UNI-DRIVE WIRE WINDER



WIRE WINDER Our New Uni-Drive Wire Winder is new in design and incorporates several improved and tested features. Production is stepped up through increased speed. It produces smooth, even and accurately wound spools of wire in single or multiple ends. All strands parallel — no over or under-winding. Can also be furnished with a slight spiral pattern for winding exceedingly fine wire. Automatic Stop Motion controls each strand. Traverse adjustable from 1¾" to 5½" between spool heads without changing cam. Designed especially for winding wire to be braided and shielded for electrical conductors.

Various types of supply packages that may be wound on Standard Uni-Drive Wire Winder.

PAY-OFF Our Pay-off Attachment consists of a heavy fabricated frame on which Pay-off spools are mounted to cover desired number of ends to be wound. Equipped with spindles, running on self-aligning ball bearings, with size of spindles and adapters to accommodate customers' pay-off spool. Compensating Attachment to control the tension of each individual strand of wire, applying the same tension when spool is full as when empty. Can also be adapted for use with bunching machines.

STANDARD MILL SUPPLY COMPANY
31 ESTEN AVENUE PAWTUCKET, R. I., U. S. A.

Designed for overhead distribution systems, AAAC has the strength and electrical properties of ACSR, costs the same on a footage basis and yet offers many installation, upkeep, performance, and economic advantages.

★ ★ ★

The new solid or stranded Kaiser Aluminum conductor is available bare, covered or insulated in AWG sizes from #6 on up to virtually any circular mil size which customers might require. In addition to single AAAC conductor, multiplex cables are available.

★ ★ ★

Major applications for AAAC include urban primaries, secondaries, multiplex cable neutrals for duplex, triplex and quadruplex service drops, and municipal street lighting systems.

Use HEANIUM®

WITHSTANDS HI-SPEED PRESSURE OF SYNTHETIC YARNS AND WIRE BY THE TONS

PULLEYS ARE AVAILABLE IN VARIOUS SIZES AND WITH BEARINGS OR BUSHINGS AS SPECIFIED

If guide wear is a problem in your mill . . . try Heanium® IS THE BEST GUIDE TO LOW COSTS.

OTHER STANDARD SIZES AVAILABLE

Test samples of HEANIUM stock guides will be furnished without charge.

Address sample requests to Dept. 9.
HEANY INDUSTRIAL CERAMIC CORP.
New Haven 3, Conn.

HEANY INDUSTRIAL CERAMIC CORP.
NEW HAVEN 3, CONNECTICUT

Old Rubber Tank Lining Still Going Strong

A pioneer rubber pickling tank lining installation which helped revolutionize industrial pickling practice 23 years ago is still in daily service.

★ ★ ★

Edwin E. Michaelson, purchasing agent for **The Atlantic Wire Company,** Branford, Conn., has high praise for the Triflex rubber lining projects installed by **B. F. Goodrich Industrial Products Company,** Akron, Ohio. A recent inspection shows that despite exposure to hot acid bath for nearly a quarter of a century, the rubber lining shows little or no effect from this severe service.

★ ★ ★

The original Triflex lining, a layer of acidproof hard rubber sandwiched between two layers of soft rubber, is still intact and ready for more years of service. The lining seals three 6,000-gallon tanks used for pickling low carbon steel rod and wire in 10 per cent sulphuric acid at 180-degrees Fahrenheit.

★ ★ ★

The Atlantic Wire Company purchased three Triflex-lined steel tanks in 1935 to replace the wooden tanks, which had needed frequent scraping and scrubbing and required patching about once a week. Despite constant, careful maintenance, they soon disintegrated.

★ ★ ★

According to Mr. Michaelson, the pioneer installation has been in daily use for nearly a quarter of a century, under severe conditions, with virtually no repairs or maintenance.

New Louis Allis Units

The Louis Allis Co. has announced the addition of a motorized gear unit, called "Line-A-Spede", to its line of integral and right angle gearmotors.

★ ★ ★

Line-A-Spede drives are gear reducers having double, triple and

quadruple reduction gear units, with ratios up to 1487 to 1, and available for motor ratings of 1 to 75 HP.

★ ★ ★

Units are available for horizontal, vertical, flange, incline, sidewall or ceiling mounting. A backstop, to prevent reversed rotation, is an optional feature. The gear portion is available separately without motor or mounting shelf. Ask for Bulletin No. 2350.

★ ★ ★

Another four page bulletin, No. 2300, covers its new "Immersible Motor", designed for submerged operation. The motor may be close-coupled to pumps, agitators and mixers, eliminating lengthy shaft connections, intermediate bearings, couplings and special bases.

★ ★ ★

The Immersible Motor will operate in water, chemicals, abrasive industrial oils and sewage sumps. Full specifications are listed. It is manufactured in ratings from ¾ to 40 HP polyphase and ¾ to 5 HP single phase.

★ ★ ★

For either or both of these bulletins, address the company at Dept. P, 427 E. Stewart St., Milwaukee 1, Wis.

Seminars on Advantages of Wire

E. H. Titchener and Company, Binghamton, N. Y., has been putting on a series of seminars on redesign and conversion to wire before technical societies and business and industrial groups, that is proving a highly successful means of developing the use of wire for product manufacture.

★ ★ ★

The plan is an important one for the wire industry in that it increases the consumption of wire. In the seminars, which are conducted by **T. W. Whipple, the** company's vice president, numerous examples of products previously made of cast metals, sheet stampings, welded strip assemblies, etc., are compared as to consumption of metal, weight, strength and price with the wire counterparts.

The company's customer list reads like a Blue Book of top American industrial firms, so successful has been this constructive selling effort. Titchener is one of the largest producers of wire forms of the country, much of its success being attributed to its ability to engineer product designs in wires of all types to do a better job at substantial savings in cost to the customer.

New Aerial Cable Supports

John A. Roebling's Sons Corp., Trenton 2, N. J., has developed a new type of support for aerial power cables called "Roeclamps." Advantages of the supports are that they require no tools for installation, they minimize tree problems, are easy to install and allow replacements of cable to be made readily. They can be used to replace the conventional cross arms on poles and may be spaced at intervals along long spans to hold cables in a relatively constant relation to the copperweld messenger and distribute the weight of the cable. Roebling's Electrical

INCREASE PRODUCTION . . . . .

REDUCE OPERATING COSTS . . . . .

With the

New Whitacre

WIRE DRAWING and GALVANIZER

DEAD BLOCKS

YOU GET THESE ADVANTAGES:

- **No stopping for stripping.**
- **No tangling nor snarling from handling.**
- **Permits packaging into stationary container or uninterrupted palletizing on stems.**
- **Greatly reduced floor space requirements.**
- **Design simplicity. No back-gearing nor similar mechanisms.**
- **Low capital investment—low maintenance.**

See Don P. Whitacre at the Buffalo and Los Angeles conventions, or write:

WHITACRE

ENGINEERING & MANUFACTURING COMPANY

1512 W. COMMONWEALTH AVE. • ALHAMBRA, CALIF.

Telephone: CUmberland 3-7053

Wire Division will supply facts regarding Roeclamps upon request.

Guide to Salt Bath Equipment and Procedures

A wealth of heat treating equipment information is contained in the new 76-page Ajax Electric Salt Bath Furnace Catalog 117 issued by the **Ajax Electric Company,** Frankford & Delaware Avenues, Philadelphia 23, Pa.

★ ★ ★

In addition to conventional metal pot, over-the-top electrode furnaces, the catalog includes new Ajax ceramic tile pot furnaces with removable submerged electrodes; the unique new Ajax Cataract Quench furnaces with molten salt quenching power equal to that of oil; and deep furnaces with tile pots and submerged electrodes entering the bath at various levels.

★ ★ ★

Technical data includes austempering and martempering curves; charts showing penetration times for carburizing; heating rates for typical steels; radiation losses and various other factors. A section is devoted to mechanized salt bath processes, including "jack rabbit," push-pull, elevator indexing and special mechanisms.

★ ★ ★

Details on salt bath applications cover every type of work to which the salt bath process is applicable. More than 50 installation pictures clearly indicate the fast-growing importance of salt bath procedures on a wide variety of work.

★ ★ ★

A copy of the catalog is obtainable on letterhead request to the manufacturer.

SPOOLS FOR SALE

We own and offer subject to prior sale the following used SPOOLS in excellent condition.

	Quantity	Type	Head Diameter	Traverse	Barrel Diameter	Bore	Mfd. by
(1)	5,000	ALL STEEL	8"	6"	4½"	¾"	Mossberg
(2)	5,000	ALL STEEL	6"	6"	3½"	⅝"	Mossberg
(3)	12,000	ALUMINUM	6"	3½"	3½"	⅝"	Acrometal
(4)	12,000	ALUMINUM	4½"	3½"	2½"	⅝"	Acrometal
(5)	1,700	ALUMINUM	4½"	3"	2½"	⅝"	Acrometal
(6)	6,143	ALUMINUM	2½"	3"	1¾"	⅝"	—
(7)	500	ALUMINUM	3"	3"	1¾"	⅝"	—
(8)	15,000	METAL CLAD	6"	2¾"	2½"	⅝"	Hubbard
(9)	55,000	METAL CLAD	4½"	3"	2"	⅝"	Hubbard
(10)	50,000	METAL CLAD	4½"	2¾"	2"	⅝"	Hubbard
(11)	20,000	METAL CLAD	3½"	2¾"	1¾"	⅝"	Hubbard
(12)	26,000	METAL CLAD	3"	2¾"	1¾"	⅝"	Hubbard
(13)	18,000	ALL METAL	3"	3½"	1¾"	⅝"	J. L. Clark
(14)	48,000	ALL METAL	3"	2¾"	1¾"	⅝"	J. L. Clark
(15)	17,000	ALL METAL	2½"	3"	1½"	⅝"	J. L. Clark

Address inquiries to

PLYMOUTH WIRE & CABLE COMPANY

17 Hermon St. • Worcester, Mass.

Tel.: PLeasant 6-8027

Tips on Roll Selection and Maintenance

A special issue of the Fenn Engineering News contains "Suggestions On Rolls For Best Strip Rolling Practice." It contains basic information on type of rolls and their uses, selection tips, answers to common roll questions, and maintenance advice.

★ ★ ★

If you would like to receive this and a list of other subjects covered, write to **The Fenn Manufacturing Company,** Newington, Conn.

New Rope Construction Announced

Herringbone wire rope, a new construction which combines the flexibility and abrasion-resistant characteristics of Lang lay rope with the structural stability of regular lay, has been developed by **John A. Roebling's Sons Corporation,** Trenton, N. J., it was announced by **W. A. Huber,** general product manager of the wire rope division.

★ ★ ★

The wires in regular lay rope are laid in a direction opposite to that of the strands in the finished rope, while the wires in Lang lay rope follow the same direction as the finished strands. Herringbone rope is fabricated of two pairs of Lang lay strands separated by two strands of regular lay.

★ ★ ★

Thus the tough and relatively large outer wires will withstand the friction resulting from continued contact with sheaves, drums and other external objects, while the smaller and highly flexible inner strands enable the rope to sustain the most severe bending stresses.

★ ★ ★

Herringbone rope is made exclusively of Type 1105 wire, developed by Roebling, because it provides maximum strength and durability in the finished rope. Type 1105 is the wire used for Roebling's highest grade lines.

★ ★ ★

The new wire ropes are of the 6 x 37 classification, are preformed, and are 15 per cent stronger than improved plow steel ropes.

Continental Steel Producing Welded Wire Fabrics

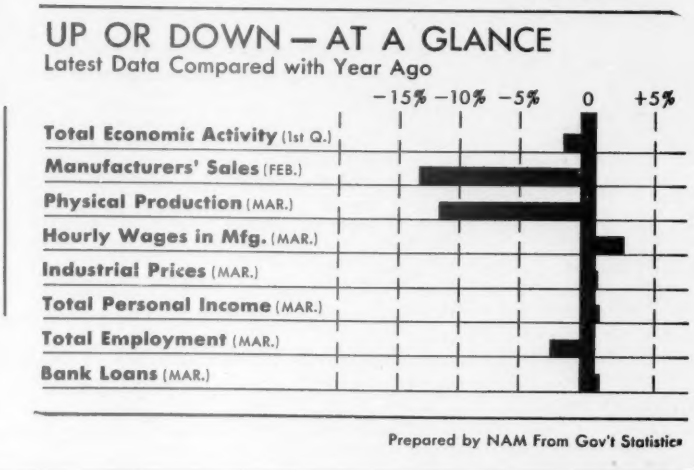
Welded wire reinforcing fabric is being produced in king size rolls these days by **Continental Steel Corporation,** Kokomo, Ind. Rolls of fabric for concrete pipe reinforcement will weigh over 2½ tons. Such king size rolls are 54" in diameter and 94" long, containing 450 lineal feet of fabric, being produced on a custom built welding machine recently installed in Continental's fabric department. The machine, manufactured by the **National Electric Welding Machines Company,** was designed especially for Continental for producing welded wire fabric in many sizes and gauges to meet specific needs of Continental customers. Another new installation at Continental includes a machine capable of producing five-foot wide rolls at the rate of 200 lineal feet per minute. At this rated capacity, the machine could deliver in a single 5-day week of continuous operation more than enough fabric to reinforce a 5-foot sidewalk stretching from Chicago to Toledo.

Get the habit of reading regularly

WIRE AND WIRE PRODUCTS

The Wire Man's Magazine

NEWS-FACTS ON ECONOMIC CONDITIONS


UP OR DOWN — AT A GLANCE
Latest Data Compared with Year Ago
−15% −10% −5% 0 +5%
Total Economic Activity (1st Q.)
Manufacturers' Sales (FEB.)
Physical Production (MAR.)
Hourly Wages in Mfg. (MAR.)
Industrial Prices (MAR.)
Total Personal Income (MAR.)
Total Employment (MAR.)
Bank Loans (MAR.)
Prepared by NAM From Gov't Statistics

the right combination

YOUR SPECIFICATIONS and BURLINGTON PRODUCTS

TAKE-UPS—"A" FRAME, ROLLER, TRAVERSING — **PAY-OFFS — CAPSTANS — REEL ARBORS — LARGE SHOP REELS — RE-REELERS — COILERS — REEL RACKS — STRAND GUIDES — DRIVE-IN PALLET RACKS**—FOR COMPOUNDS AND REELED WIRE.

BFI STD. PRODUCTS DIV.
BURLINGTON FABRICATORS INC.
BURLINGTON, N. J.

Table 1.—Demand for Copper-Base Mill and Foundry Products, 1957-58[a]

[Millions of pounds—metal weight]

Item	1957					1958			
	Third quarter		Fourth quarter		Year	First quarter		Second quarter	
	Stated requirements	Actual deliveries	Stated requirements	Actual deliveries[p]	Actual deliveries	Stated requirements	Estimated deliveries	Stated requirements	Estimated deliveries
Brass mill products	41	474	30	506	2,053	30	475	29	485
Unalloyed[1]	13	181	5	182	752	5	165	4	170
Rod, bar, and wire	.....	26	.....	26	111	.....	.....	.....	.....
Sheet and strip	.....	46	.....	48	208	.....	.....	.....	.....
Tube and pipe	.....	97	.....	92	382	.....	.....	.....	.....
Alloyed[1]	28	293	25	324	1,301	25	310	25	315
Rod, bar, and wire	.....	125	.....	140	566	.....	.....	.....	.....
Sheet and strip[2]	.....	123	.....	133	533	.....	.....	.....	.....
Tube and pipe	.....	33	.....	35	147	.....	.....	.....	.....
Wire mill products[1] (copper content)	31	367	19	373	1,564	19	370	19	375
Foundry and powder mill products	13	219	7	222	324	7	222	7	225
Foundry products	.....	211	.....	213	888	.....	213	.....	216
Powder mill products	.....	8	.....	9	36	.....	9	.....	9

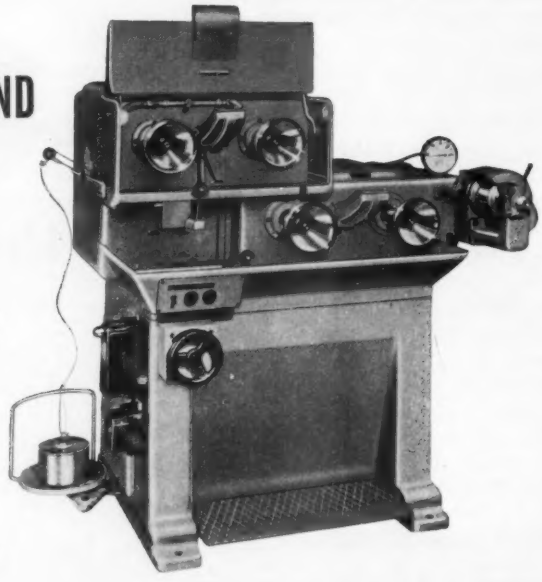
[a]Stated requirements represent military demand under the Defense Materials System (DMS); deliveries represent effective total demand, both military and non-military, as indicated by current information. [p]Preliminary. [1]Actual deliveries include imports of mill products (not available in detailed brass mill product breakdown); estimated quarterly deliveries exclude imports. [2]Includes military ammunition (from strip) on a cup-and-disc weight basis.

Source: BDSAF-83, BDSAF-84, Office of Defense Mobilization, and Bureau of the Census.

EW

ALL MACHINES FOR DRAWING FERROUS AND NON FERROUS WIRES

OPERATING UNDER THE SUBMERGED OR DRY SYSTEM



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FOR SUPER-PRODUCTION SPEEDS
FOR CAPILLARY WIRE UP TO 0.03 mm. (.0012")

Please, contact us.

Emilio Wartenweiler

MILANO (ITALY)
VIA G. B. PERGOLESI N. 18

ALUMINUM INGOT AND MILL PRODUCTS AND MAGNESIUM MILL PRODUCTS: FEBRUARY 1958

(Shipments and receipts are in thousands of pounds)

Item	Number of companies reporting shipments	February 1958			January* 1958 net shipments	February 1957 net shipments
		Gross[1] shipments	Receipts[2]	Net[3] shipments		
ALUMINUM PIG AND INGOT, TOTAL	85	127,301	70,964	56,337	76,109	100,121
ALUMINUM MILL PRODUCTS, TOTAL	156	196,069	16,806	179,263	193,678	207,459
Sheet and plate, non-heat-treatable	28	78,929	12,959	65,970	67,751	70,958
Sheet and plate, heat-treatable	4	(D)	(D)	13,773	16,458	24,099
Foil, including foil in lamination	15	(D)	(D)	14,077	17,832	15,158
Rolled, and continuous cast, rod and bar[4]	5	7,692	2,998	4,694	6,575	8,980
Wire, bare, conductor and nonconductor	16	2,929	160	2,769	3,582	4,246
ACSR and aluminum cable, bare	11	(D)	(D)	14,196	13,657	13,583
Wire and cable, insulated or covered	15	3,497	..	3,497	4,676	4,154
Extruded shapes, soft alloys	98	45,718	565	45,153	48,359	43,554
Extruded shapes, hard alloys	9	2,883	...	2,883	2,876	6,450
Drawn tube, soft alloys	14	(D)	(D)	4,643	4,782	5,193
Drawn tube, hard alloys	7	(D)	(D)	1,565	1,171	[5]3,099
Welded tube, non-heat-treatable						
Powder and paste						
Atomized and grained powder	3	450	...	450	384	684
Flaked powder	5	348	...	348	289	422
Paste	5	813	...	813	865	821
Forgings (including impact extrusions)	13	4,432	...	4,432	4,421	6,058
MAGNESIUM MILL PRODUCTS, TOTAL	10	(D)	(D)	1,280	1,271	2,522

*Revised.

D Withheld to avoid disclosing figures of individual companies. These figures are included, however, in the appropriate total.

[1]Gross shipments of mill products represent total shipments by producers to customers, including other producers, and shipments by producers to their own fabricating departments which manufacture products beyond the level of mill shapes. Ingot gross shipments include shipments by importers.

[2]For mill products, represents receipts from domestic producers only. In addition to receipts from domestic producers, 93,000 pounds of mill shapes were received through imports. For ingot, receipts from imports are included.

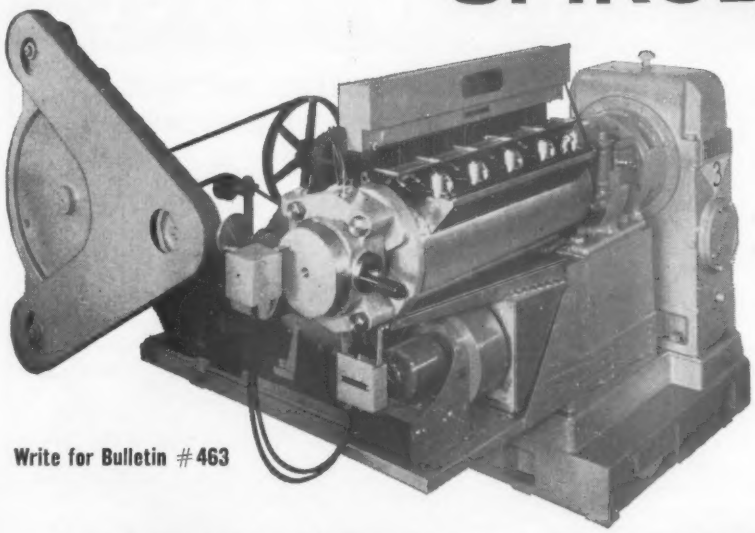
[3]For mill products, derived by subtracting the sum of producer's domestic receipts of each mill shape from the industry's gross shipments of that shape. Ingot data derived by subtracting all receipts from shipments reported.

[4]Includes a small amount of rolled structural shapes.

[5]Includes a small amount of welded tube, heat-treatable.

ROYLE

SPIROD® for Rubber or Plastic Wire Insulating



Write for Bulletin #463

These all electric extruders with radiant heat and high velocity evaporative cooling are designed to process either plastic or rubber compounds. The result of more than three quarters of a century of experience — Royle pioneered the extrusion process in 1880— in the design and construction of extruding machines time tested features have been built into Spirod to assure dependability.

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

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BLackstone 3-9222

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Okura Trading Co., Ltd.
(56) 2130 - 2149

Price Reduction Announced

The Parts Division of **Sylvania Electric Products, Inc.**, Warren, Pa., has announced a reduction of 10 cents per pound (about 3%) on all sizes of Kulgrid 28 wire and ribbon.

* * *

The company's wire plant is well-known for its fine quality of plated, clad and alloy wires for many industrial applications.

Association's and NEMA Representatives Meet

At a special meeting during NEMA's Wire and Cable Section meeting on April 28 at Rye, N. Y., representatives of **The Wire Association** met with those of NEMA to discuss our activities primarily in relation to NEMA.

* * *

Attending the conference from **The Wire Association** were **Hugo W. Biskeborn**, Vice President, **Richard E. Brown**, Executive Secretary, and **J. Edward Donnellan**; from NEMA were **B. F. Ilsley**, Chairman of Wire and Cable Section, **W. E. Sprackling**, Anaconda's President, **J. R. MacDonald**, General Cable's Chairman of the Board, and **Myron D. Miller**, Secretary of the Wire and Cable Section.

* * *

The point at issue was whether our new activities through the Association's Electric Wire and Cable Section were likely to conflict with and overlap the services of NEMA or other technical societies.

* * *

It was pointed out that **The Wire Association's** interests lay in the production phases of electric wire and cable manufacture—that is, how to make the wire—and had nothing to do with the setting of standards, such as is engaged in by societies like NEMA, ASTM, AIEE and IPCEA.

* * *

With respect to design matters, only those problems that originate in a mill in connection with production were considered to be within the scope of our activities. Design questions prior to cable construction was agreed to be a function of these other societies.

* * *

In the field of dielectrics, the NEMA representatives felt that questions relating to testing, specification and securing acceptance was a function of other technical societies, whereas processing, application and insulated wire manufacturing problems were quite properly the concern of our Association.

* * *

The questions of installation and field experience, it also was agreed, properly came within the scope of the other societies and the Association was assured of their continued friendly relationship under the circumstances discussed.

* * *

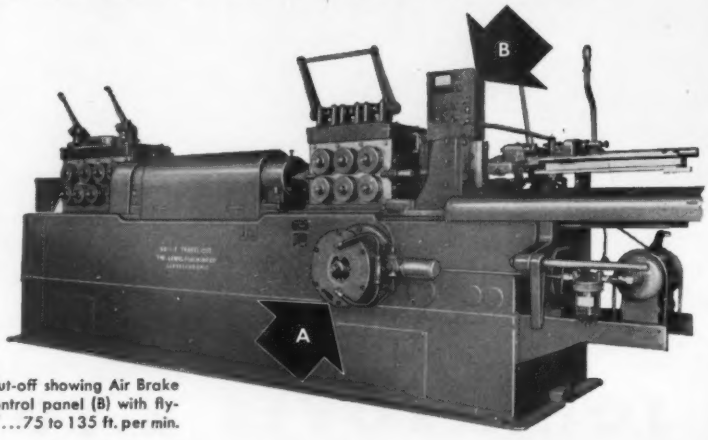
It was stressed that the Associ-

SUPERIOR QUALITY CONTROL!

WITH LEWIS TRAVEL-CUT WIRE STRAIGHTENING AND CUTTING MACHINES EQUIPPED WITH AIR CLUTCH, AIR BRAKE AND VARIABLE SPEED DRIVE

Lewis engineers have added three important improvements to their famous Travel-Cut Wire Straightening and Cutting Machines, 1. Wichita Air Clutch, 2. Wichita Air Brake, 3. Reeves Motodrive or similar variable speed drive, for SUPERIOR QUALITY CONTROL. Assures greater accuracy and produces quality rod with a minimum of spot swell. Lewis Machines are available in 34 models to handle from .012″ to ¾″ dia. at speeds up to 200 FPM.

NEW BROCHURE ON REQUEST



No. 11-F Travel-Cut with Flying Shear Cut-off showing Air Brake (A) (guard removed) and push-button control panel (B) with flywheel speed tachometer. Cap. ½″ to ¾″...75 to 135 ft. per min.

THE LEWIS MACHINE COMPANY 3440 EAST 76th STREET CLEVELAND 27, OHIO

ation is in no way desirous of duplicating the services of other societies and wishes to continue to confine its work to matters of concern to production men. The conference served to clarify and emphasize these objectives to the satisfaction of all present.

Catalog on Rolling Mills

The Fenn Manufacturing Company, Newington, Conn., has produced a comprehensive new catalog on Rolling Mills. Included is the Fenn Standard Line, from 20″ to 3″ roll diameter mills, a complete section on mills for laboratory and advanced development, wire flattening mills, and a complete line of related accessories.

★ ★ ★

Special features include formulae for selection of mills for rolling strip and wire, and a comparative specification chart for all Fenn Rolling Mills. Profusely illustrated, the catalog is attractively printed in three colors. Copies are available by sending your name and title on Company letterhead to the company.

Machining of Cobalt Superalloys

A special report on "Machining of Cobalt Superalloys" is now available from the Cobalt Information Center.

★ ★ ★

Machining data and operating instructions are given for 22 superalloys and 3 metal-glass sealing alloys. Drilling, turning, facing, milling, broaching, reaming, shaping, tapping, cutoff, and unusual machining methods of superalloys are discussed. Tables provide information on tool material and geometry, tool material guides, machinability index and horsepower required at the cutting point, and on the conversion of SFM to RPM. Twenty-three references are included.

★ ★ ★

This report, prepared by **C. T. Olofson** and **F. R. Morral** of **Battelle Memorial Institute,** may be obtained by directing requests on company letterhead to the Cobalt

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Look to Nopco next time—every time—you order chemicals for your wiredrawing operations. Remember, with Nopco plants and warehouses strategically located across the nation, you are assured prompt delivery. And remember, too, Nopco has a wealth of technical experience in the application of these chemicals in the wiredrawing industry—has built its business by solving the problems of its customers. Our technical facilities and know-how are, of course, available to you—to help solve your particular problems. Simply write or telephone for complete information today. Nopco Chemical Company, Harrison, N.J.

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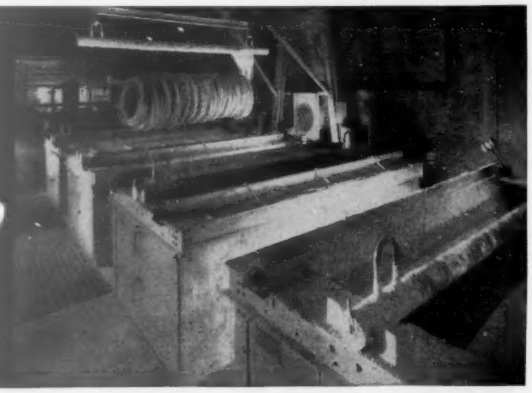
ROD BAKERS



Faster baking, greater fuel economy, maximum production efficiency are just a few of the results of the exclusive heating arrangement of the Carl Mayer Hi-Speed Rod Baker. It also has a patented blow-off feature which removes moisture without damage to coils.

Here are just a few of our many satisfied customers:

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Indiana Steel & Wire Co.
Jones & Laughlin Steel Corp.
Republic Steel Corp.
Sheffield Steel Div., Armco Steel Corp.
Steel Company of Canada

Write for Bulletin No. 350

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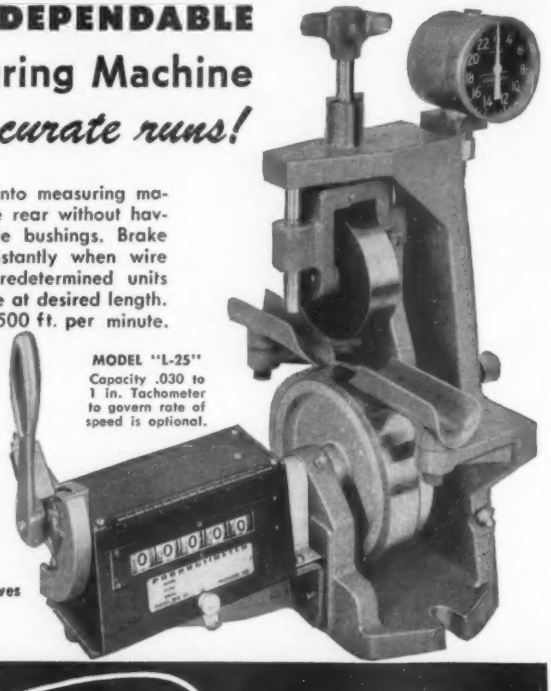
A RUGGED, DEPENDABLE
Wire Measuring Machine
for fast, accurate runs!

Wire is easily "loaded" into measuring machine from the side or the rear without having to feed through guide bushings. Brake stops measuring wheel instantly when wire leaves measuring rolls. Predetermined units will automatically stop wire at desired length. Very accurate speeds to 2500 ft. per minute.



MODEL "L-25"
Capacity .030 to 1 in. Tachometer to govern rate of speed is optional.

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Southwire Markets Improved Conductor

Availability of aluminum transmission conductor with five important improvements, at no increase in price, has been announced by **Roy Richards,** president of **Southwire Company,** Carrollton, Ga.

★ ★ ★

The improvements are: (a) an increase in minimum conductivity to 62% IAC; (b) a higher tensile strength; (c) a greater ductility; (d) longer weld-free conductors; and, (e) smoother surface characteristics.

★ ★ ★

"This culminates three years of research and development," Mr. Richards said, "and a change-over to new melting and continuous casting equipment which is the only installation of its kind in the country."

PVC Receives UL Approval

Thompson Chemical Company, 90 Mendon Ave., Pawtucket, R. I. announces the electrical approval of its Trulon 500 polyvinyl chloride by the Underwriter Laboratories. This resin is now acceptable for interchangeability with all other approved polyvinyl chloride resins.

★ ★ ★

Trulon 500 is the result of extensive research and development by the Thompson Laboratories. The most modern technology and manufacturing techniques are used in its manufacture.

★ ★ ★

Trulon 500 is being used in large quantity in many vinyl applications. It is a most uniform gel free product, giving high rates of extrusion with a glossy, smooth surface. It can be used equally well from dry blends or granules.

★ ★ ★

Specification information and samples on Trulon 500 are readily available.

Sub-Committee of Electric Wire and Cable Section Formed

At the March 25th meeting of the Organization Committee of the Electric Wire and Cable Section of **The Wire Association, Charles M. Fredrickson,** Technical Director, **Southern Electrical Co.,** Chattanooga, Tenn., was appointed Chairman of the Aluminum Wire and Cable Sub-Committee.

★ ★ ★

Mr. Fredrickson has announced that **H. S. Spaulding,** Technical Superintendent, **Kaiser Aluminum & Chemical Corp.,** Newark, Ohio, and **Marshall V. Yokelson,** Chief Research Metallurgist, **General Cable Corp.,** Bayonne, N. J., have agreed to serve with him on this committee.

Chase Brass to Distribute Kaiser Aluminum Products

Chase Brass & Copper Co., Inc. has been appointed a distributor of Kaiser Aluminum rod, bar and wire products, it has been announced by **Kaiser Aluminum & Chemical Sales, Inc.**

★ ★ ★

Chase Brass, with headquarters in Waterbury, Connecticut, has warehouse locations in 25 major industrial markets throughout the country, and present planning calls for eventual stocking of aluminum in all locations. Although details are not yet complete, initial stocks will soon be put into the Boston, Providence, Waterbury and New York warehouses to serve the very large screw machine and fastener industries located in New England and the Eastern Seaboard.

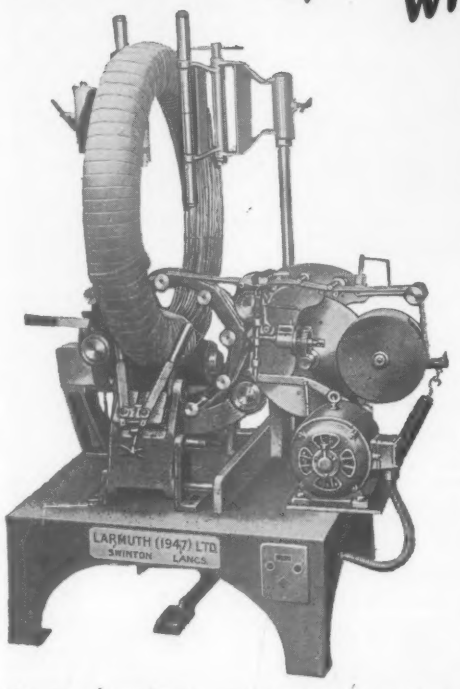
Standards on Metallic Conductors

The American Society for Testing Materials has published a new book entitled "Metallic Electrical Conductors B-1."

★ ★ ★

This publication contains 55 standards, three of which are completely new and thirteen of which are revised or had their status

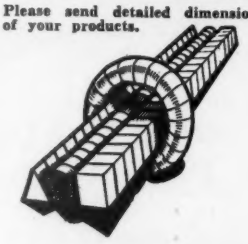
LARMUTH *Spiral Wrapping* **MACHINES**



are built to finest British engineering standards and are in use throughout the world for spiral wrapping of Motor Tyres, coils of Wire, Strip, etc., from 3" bore upwards. Also straight length Tubes, Bars, Rods, etc.

"BOUND" to get there safely.

Please send detailed dimensions of your products.



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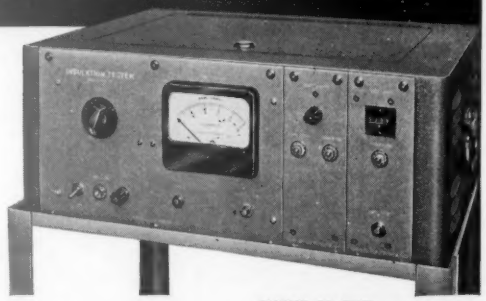
FAST WIRE SPARKING with PESCHEL DC TESTERS

Electrode of only 1-inch length permits non-destructive fault detection at production rates to 4000 fpm



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This High Voltage DC Insulation Tester is ideal for use with extruders, vulcanizers or twinners. May be used to replace AC sparkers where 0-10KV DC is ample (20KV models also available).

Accurate, efficient detection, indication and recording of every fault is assured, without burning or marking insulation. Safe and easy operation by unskilled personnel. "Zero-length" electrodes (1" and shorter!) conserve floor space. Supervisory circuits and sectionalized construction facilitate servicing.

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- Holds up to 100 lbs. of wire.
- Higher impact strength — little breakage.
- Low in cost — no repairs or bookkeeping.
- Waxed for water absorption resistance.
- Every reel brand new — hence accurate and true.
- Produced to customers' specifications.
- Customers' labels can be applied.

ALSO WOOD and PLYWOOD SPOOLS & REELS

DURKEE MFG. CO.

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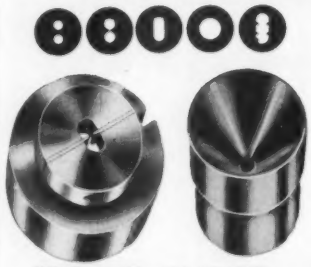
INSULATING DIES AND NOZZLES

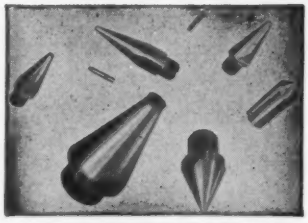
for EXTRA-HIGH ELECTRIC WIRE PRODUCTION



STEEL DIES—ALL SHAPES.

CARBIDE AND STEEL

Highest Quality Workmanship and Materials. Standard Types and Special.



CARBIDE EXTRUSION NOZZLES OR TIPS FOR ALL MACHINES.

BRIDGEPORT CARBIDE NOZZLES have phenomenally long life, will lower operating costs and reduce wire breakage.

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LEADER IN HIGH PRODUCTION EXTRUSION TOOLS FOR ELECTRIC WIRE

changed, since the issuance of a similar book in 1955.

★ ★ ★

Materials covered are copper alloys, copper, coppered steel, aluminum and galvanized steel and iron.

★ ★ ★

The book contains 334 pages and costs $3.75. Members may buy copies for $3.00. It may be ordered from ASTM, 1916 Race St., Philadelphia 3, Pa.

New High-Temp Wire

Anaconda Wire & Cable Co., New York, N. Y., has developed a glass fiber covered magnet wire capable of sustained use of temperatures of 428°F and for short exposures to temperatures up to 932°F.

★ ★ ★

The wire, called Silotex-N, has one or more layers of glass fiber, bonded with a Silicone resin, on a nickel plated wire. For temperatures above 932°F the silicone resin may be replaced with an inorganic binder, but the magnet wire has good dielectric strength even after losing its silicone bonding.

Wire and Cable Industry Pricing Itself Out of Market

O. W. Titus, President of **Canada Wire & Cable Co., Ltd.,** in dedicating the company's new Magnet Wire Division plant at Simcoe, Ontario, warned that Canadian industry was in imminent danger of losing its export markets.

★ ★ ★

He based this on three factors: 1) that European plants are retooled for efficient production; 2) that foreign wage scales are about one-third of theirs; and 3) that labor's demand for ever-increasing wages is inflationary and makes selling abroad more and more difficult.

★ ★ ★

To complete successfully with European producers, he pointed out that it would be necessary for Canadians to produce 3 times as much wire and cable in a given

time on equivalent machines. To this no one has found an answer.

★ ★ ★

What Mr. Titus expressed for Canadian industry might well be echoed in the United States.

Recommends Greater Use of Diamonds

Although an unlimited supply of man-made industrial diamonds is now assured, the country has been slow to take advantage of the many uses to which they can be put, according to **John D. Kennedy**, head of the Diamond Section of GE's **Metallurgical Products Department.**

★ ★ ★

Since selling its first synthetic diamonds in January, 1957, at $5.10 per carat, the price was lowered last October to $4.25 and now, due to improved production techniques, the price has been reduced to $3.48 per carat.

★ ★ ★

Heretofore, 97% of the diamonds came from one source and there was a chronic shortage. With the development of processes to produce diamonds here, the threat of insufficient supply and controlled prices is a thing of the past. Mr. Kennedy believes that industry could profit from investigations into the use of diamonds for many grinding and cutting operations where older methods are still current.

★ ★ ★

The Diamond Section of the Metallurgical Products Department of General Electric Co., Detroit 32, Mich., will be glad to assist in working out new applications for this important industrial product.

Copperweld Steel Producing New Aluminum Clad Wire

Copperweld Steel Company announced that it is ready to accept orders for "Alumoweld" wire, a completely new product for use in electrical transmission and distribution lines, according to President **James M. Darbaker.**

★ ★ ★

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AUTOMATIC WIRE STRAIGHTENING & CUT-OFF MACHINES

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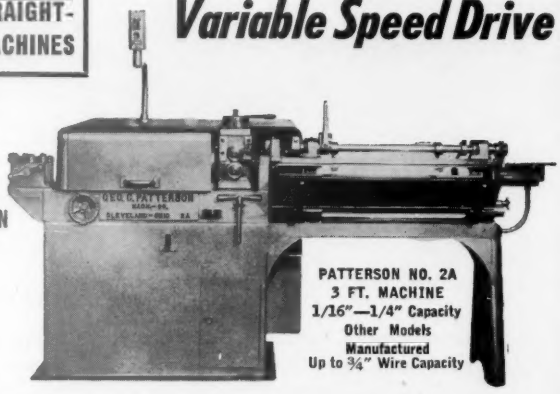

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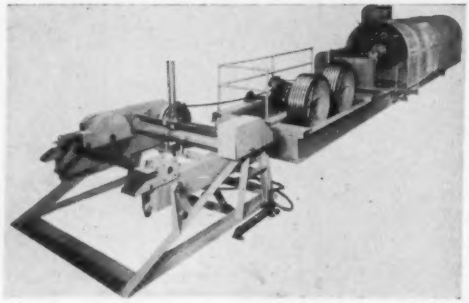

Made in three sizes to accommodate reels 30, 36, or 48 inches in diameter.

Built to handle wires up to No. 4 in the 30 and 36 inch reel sizes and up to No. 0000 in the 48 inch size.

Rotor speeds from 173 to 800 r.p.m. in the 30 and 36 inch reel sizes and from 30 to 600 r.p.m. in the 48 inch reel size.

Rates of lay 30 and 36 inch reel size 1 to 24 inches, in the 48 inch size, 2 to 44 inches.

Supplied with filling, taping and binding attachments as desired.

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Write for further details of this efficient machine.

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101 E. Indianola Ave. Established in 1912 **Youngstown 7, Ohio**

Copperweld is the first company to apply successfully a heavy cladding of aluminum to a steel rod by a controlled weld process. The new product is composed of 25 per cent of aluminum by area as compared to much smaller percentages for aluminum covered steel wire made by other processes.

★ ★ ★

Mr. Darbaker said the new product had been developed by the company jointly with **Battelle Memorial Institute,** Columbus, Ohio. A pilot plant near Columbus is now in limited production of "Alumoweld" rods which are being drawn into wire at Copperweld's Glassport, Pa. plant.

★ ★ ★

The company described the process as a "heat and pressure" procedure on which patents are pending. It differs from the process used to make "Copperweld" wire in which copper is welded to the steel while the latter is still in a heavy billet form. In the "Alumoweld" process the aluminum is added to a steel rod and the bimetallic rod is drawn into wire.

Bulletin on Turbo Wire and Cable

The William Brand & Co., North and Valley Sts., Willimantic, Conn., has issued a 6-page bulletin on its line of plastic insulated wire and cable, that bears the trade name "Turbo."

★ ★ ★

The bulletin gives specification data on military hook-up wire, silicone insulated wires, coaxial cables, aircraft wire and cable, multiconductor cables, U. L. approved hook-up and appliance wires, Canadian Standards approved wires and various types of vinyl and coated electrical tubing. Some of these are pictured and described.

★ ★ ★

A copy of this bulletin may be procured by writing to the company.

The Manufacture of Can Keys

(*Continued from page 666*)

flattens the end of each key and pierces a slot through this flattened surface. Before the key is a finished product, the machine does two other operations. A pair of dies form two welding points on the extreme end. Another die, indents or deforms the wire between the welding points and the slot. This indentation marks the fracture point where the key can be easily broken off from the can. The end of the key with the two welding points is the portion that remains on the can bottom after the user has disposed of the key.

★ ★ ★

The finished keys are again machine racked on rods to await their final union with the can bottom in a key and cover welding machine. This machine arc welds the two projecting points on the key to the can bottom. From there it becomes an integral part of the can until it fulfills its destiny in the kitchen.

★ ★ ★

Some years ago, the lowly can key became a problem to grocers. That was when it was welded to the top of the can. The key being in plain view was too tempting to the younger generation of consumers who couldn't resist pulling them off. Can manufacturers now observe the philosophy "out of sight, out of mind." The key now arrives at the kitchen, intact and on the bottom of the can.

Offers Diamond Reclaim Service

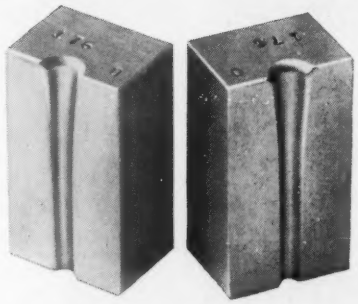
Reclaiming waste or used diamond is a new service announced by the Abrasives Division of the **Elgin National Watch Company.** This service assures accurate assay of sludge for manufacturers using diamond compounds and powders for lapping or diamond wheels for grinding.

★ ★ ★

Elgin will either assay the entire sludge and buy it outright or will clean, regrade, and return the diamond content. Elgin also offers a compounding service for reclaimed material after cleaning and grading. For the latter, all three of Elgin's compound vehicles

Sjogren POINTING DIES

SJOGREN Pointing Dies have proven themselves! Made from shock-resisting high grade steel they assure many hours of hard, continuous usage. Fit your swaging machines with these rugged, S & S Pointing Dies, made to order on your specifications, they guarantee you service.



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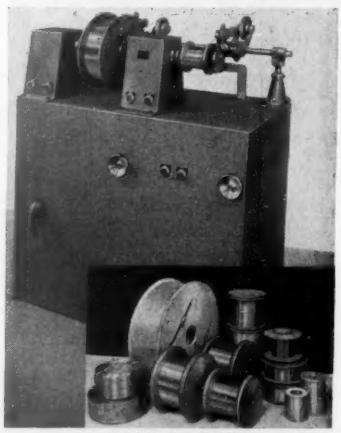
The 1900-HVE Spooler is a rigid, precision machine that will produce a uniform dense lay of wire consistently. It is completely adaptable to constant or changing demands. Adjustments can be made accurately with the spooler in operation and without tools. All controls are positive.

Your special requirements can be incorporated in the design.

You are invited to consult us on your wire spooling problems. Our engineering resources and 60 years of experience are at your service.



SPECIFICATIONS

Size Range: .010" to .080" or heavier if soft, and many flat wire sizes. Max. Spool Size: 16" flange diam. Capacity: Usually 4 to 10 spindles.

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from just
One *dip!*

coat with
BORAX 5 MOL.

Here are the advantages you get when your stock is Borax-coated...

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are available. Users requesting clean-and-regrade service will have the diamond content in their sludge returned at a purity which exceeds Bureau of Standards specifications.

★ ★ ★

The service is completed in 2 to 8 weeks, depending on the type of operation desired. Full information may be obtained by writing the Abrasives Division of the Elgin National Watch Company, Elgin, Ill., or by contacting your local Elgin Field Engineer.

Monel Lightning Rods

Lightning rods made of Monel nickel-copper alloy are used on power plant and refinery stacks because the heat and corrosive conditions cause ordinary rods to deteriorate rapidly. The Monel rods effectively resist corrosion from the stack gases.

Large Scale Continuous Annealing of Coils with Carbon Restoration

(*Continued from page 657*)

Conclusion

Large volume production up to 1000 tons a month make this specialized furnace a highly economical production tool. Its six zones of individually controlled temperature permit maximum flexibility of cycle control, although two basic cycles accommodate 90% of all production requirements. Suction type gas-fired radiant tubes prevent contamination of furnace atmosphere. Recirculating fans provide temperature uniformity and achieve ideal atmosphere circulation for complete contact of the surface of the coils.

★ ★ ★

Even the most rigid customer specifications can be met with uniform microstructures and completely surface carbon restored stock made available for the most exacting heat treating requirements. Standby facilities further insure maximum production from the furnace and protection of personnel and equipment against the ever-present hazards encountered with combustible atmosphere operating below 1400F.

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Footnotes

(1) "Annealing Bar Stock for Automatics," J. D. Armour, Steel, March 1949.

(2) "Continuous Annealing with Carbon Restoration," J. D. Armour, Iron Age, April 1952.

(3) a—"Carbon Concentration Control," de Coriolis, Cullen, Huebler, ASM Transactions 1946.

b—"Dew Point vs % CO_2 as Furnace Atmosphere Control Check," Groves, Industrial Heating, June 1949.

(4) A gaseous system composed of CO_2, CO, H_2, CH_4, H_2O, and N_2 is always in equilibrium with a particular carbon concentration in steel at a particular temperature. The carbon equilibrium of the atmosphere can be predicted on the basis of the analysis and dew point. Of these gases, carbon monoxide and methane are carburizing; carbon dioxide, water vapor and moist hydrogen are decarburizing; nitrogen is inert.

★ ★ ★

Carburizing reactions defining this system are:

$$3Fe + 2CO \rightleftharpoons Fe_3C + CO_2$$
$$3Fe + CH_4 \rightleftharpoons Fe_3C + 2H_2$$
$$3Fe + CO + H_2 \rightleftharpoons Fe_3C + H_2O$$

★ ★ ★

In the above reactions CO and CH_4 are the possible sources of carbon, and the carbon equilibrium of these particular reactions is established by the percentages of CO_2, H_2O and H_2. Intergaseous reactions function in such a manner that with fixed amounts of CO and H_2, the quantities of carbon dioxide and water vapor have a definite relationship:

$$CO + H_2O = CO_2 + H_2$$
(Water Gas reaction)

★ ★ ★

From the above conditions it has been derived that, at equilibrium, the $\%H_2O$ reflects the $\%CO_2$. A change in dew point (H_2O) of 1.5°F will change the carbon potential .05% in the range of commercial practice. A similar change in carbon potential would be reflected in a change of .02% CO_2. By standard testing methods it is very easy to measure a dew point change of 1.5°F, while it is extremely difficult to measure .02% of CO_2. It follows that the dew point is the quickest and most accurate indication of the CO_2, moisture and thus the carbon potential of the atmosphere. Methane is a very good source for carbon and when used in properly controlled amounts it provides a source of carbon for replenishment to maintain the correct balance of CO in the furnace atmosphere in this manner:

$$CO_2 + CH_4 = 2CO + 2H_2$$
$$H_2O + CH_4 = CO + 3H_2$$

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- **EXTRUDERS** 2½" TO 6"
- **CAPSTANS**
- **BRAIDERS**
- **TWINNERS** UP TO 5 WIRE
- **TAKE-UPS**
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CABLE "JALENCO", PROVIDENCE

ENGLAND—General Engineering Co., (Radcliffe) Ltd., Station Works, Bury Road, Radcliffe, Lancashire, England.

New Booklet on Box Closure Methods Now Available From Acme Steel Company

A Guide to Better Closures, specially prepared for users of fibreboard boxes and packages, has been published by **Acme Steel Company** of Chicago.

★ ★ ★

The brochure is intended as a guide to effect economies and stepped-up production in the closure of fibreboard boxes. It contains a collection of reliable information on closure methods, taken from user surveys, published works and manufacturers' statements.

★ ★ ★

Closure methods such as hand and machine gluing, taping, stapling and wire stitching are discussed along with advantages and disadvantages of each. A special section on regulations for sealing fibreboard containers contains the basic rules for the sealing of Regular Slotted Containers, quoted from Uniform Freight Classification Number 3, Rule 41, Section 7.

★ ★ ★

The brochure contains a section on wire stitching for all kinds of fibreboard boxes along with brief descriptions of the company's stitching methods.

★ ★ ★

Copies are available by writing to Acme Steel Products Division, Acme Steel Company, 135th and Perry Avenue, Chicago 27, Ill.

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Questions and Answers

(*Continued from page 654*)

the rod surface from being scratched with lifting tongs while being loaded on the pay-off reel? We don't mean scratched enough to have large slivers.

Answer: Rod surfaces should be protected as much as possible but we do not believe they could be damaged enough by handling to cause trouble unless you are using very unusual equipment.

★ ★ ★

Question: Is our assumption correct, the greater the entrance angle on the ripper, the heavier the coat of lubricant put on the wire?

Answer: Yes and no. The angle must be large enough to allow plenty of soap to get into the die, but could also be too large. We believe the length of the angle is very important. Also, we believe that the lubricant that flows on an uninterrupted line is the only lubricant that gets on the rod. The amount of lime or carrier on the rod determines the amount of lubricant you get on the wire.

★ ★ ★

Question: Is our assumption correct, the less the entrance angle on the ripper, less pressure per square inch required; therefore, do not have to be so particular to have a high pressure lubricant?

Answer: No comment—a very debatable question.

★ ★ ★

Question: Why do many wire drawers mix lime with standard recommended lubricants?

Answer: A good wire drawer can smooth out the operation this way. Soap may be standard but operations are not always standard.

★ ★ ★

Question: What are the advantages and disadvantages of mixing lime with lube?

Answer: See Answers immediately preceding and following this question.

★ ★ ★

Question: We assume mixing lime with lubricant would give a thicker coating in the ripper box and that too much lime mixed with the compound would decrease the lubricating qualities of the lubricant compound?

Answer: This is correct, and mixing lime with lubricant can be overdone.

★ ★ ★

Question: Our dies are water cooled. Is it possible to keep the dies so cool that lubricant will not melt properly and become a paste or semi-liquid?

Answer: No. The wire gets hot although the dies do not heat up.

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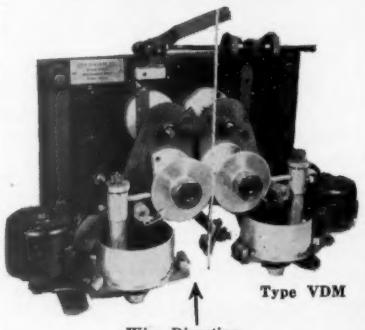

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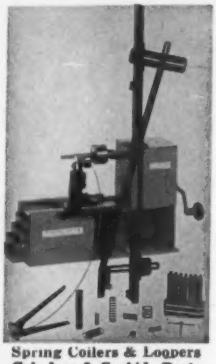

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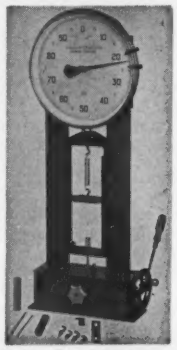

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A Method of Analyzing Wire Coatings on Copper Using Standard Metallographic Practices

(*Continued from page 642*)

of the copper become rounded, the rounded portion will extend into the enamel coating and make focusing of the entire thickness of the coating at once almost impossible. The dry method of grinding is used since it has been found to produce flatter surfaces than the wet method of grinding.

3. Rough polish the sample on a cotton cloth without nap using levigated alumina with a particle size of 5 microns.
4. Finally, polish the sample on a silk cloth with 125 threads per inch using chromic oxide with a particle size of 1.0 microns. Polishing cloths without nap were found to produce flatter surfaces than those which have nap.

★ ★ ★

The sample is now ready to be etched. The specimen is etched with a saturated aqueous solution of chromic trioxide. The etch is applied by placing a few drops of the solution on the sample with an eyedropper or glass tube. No swabbing material has been found which is satisfactory. Cotton and hair are attacked by the etching solution, and glass wool or glass cloths scratch the enamel coating. The etching time varies with the cure of the coating. The longer the curing time on the sample, the longer will be the etching time required to give the desired etch. The etching solution is left on the sample for approximately 30 seconds and then washed off in a stream of water. The sample is dried and examined under a microscope to determine if further etching is necessary. If more etching is required, the above procedure is repeated until the desired etch has been obtained. Other etching solutions of an oxidizing nature such as nitric acid were tried with varying degrees of success, but the best results have been obtained with the chromic trioxide solution.

★ ★ ★

Photographs can be made of the etched specimens if desired. For an entire wire to be photographed, an objective lens which covers a larger field than those in most metallographic laboratories would be required. However, smaller areas can be photographed quite satisfactorily. Photographs cannot

be expected to show the same sharpness as samples subjected to visual examination. The sharpness in some parts of the area being photographed will have to be sacrificed in order to obtain reasonable sharpness for the entire area, while under visual observation the particular area which is of interest can be put in focus. Some difficulty may also be caused by variations in the etching rates of the enamel coating on a sample. For example, a corner may have a thin coating which would obtain a higher degree of cure and be more difficult to etch than other areas on the wire sample. Two photographs of etched areas are shown in Figures 1 and 2. The photographs show areas from rectangular wire which have eight passes of Formvar-type enamel.

Conclusion

This technique should be a useful laboratory tool in studying Formvar-type insulation coatings. Effects of die arrangements and configurations on the coverage can now be determined with more ease and accuracy.

New Rod Mill in Germany Embodies Many Novel Features

(*Continued from page 647*)

forms for the running-in and supervision of the mill are so located that each operator has a good view of his section. Communication between the control stands and the power centre as well as the other points concerned in the operation, is effected by two-way speakers. The operating state of the mill is optically shown on a signal-board. This board indicates which strands are rolling and whether this is done on to cooling bed or reels; it also indicates trouble in different parts of the trains, at the reels, on the cooling bed, at the power station, or in the oil lubrication or water supply.

★ ★ ★

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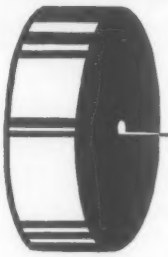

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★ ★ ★

Acknowledgement is due to Schloemann A. G. for data and illustrations.

Foamed Polyethylene Coaxial Cables

(*Continued from page* 653)

day humidity chamber test. In addition, the attenuation of the cable exposed to the elements has leveled off at this value and shows no further increase throughout a six month period.

★ ★ ★

Thus, although water vapor can enter the cellular dielectric, the increase in attenuation which results is only approximately 11 per cent of the original value at 250 mc whereas at this same frequency the cellular dielectric cables has 32 per cent less attenuation than the solid dielectric RG-11/U cable. This still represents a 25 per cent advantage of the cellular dielectric cable over the solid dielectric cable in the same physical size.

★ ★ ★

Based upon these results, the use of cellular polyethylene dielectrics in coaxial cables appears to offer decided advantages by providing lower losses and lower capacitance without sacrificing physical size and weight.

References

1. **Higgins, W. T., "Bakelite" Cellular Polyethylene, Paper Presented at Signal Corps Symposium on Cable and Wire, December 15, 1953.**
2. **Varenelli, A. D., Water Vapor Permeability Through Thermoplastic Cable Jackets, Wire & Wire Products, Volume 31, No. 3, March 1956, p. 299.**

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(*Continued from page* 681)

Triangle Officers Advanced

The elevation of **John E. Mc Auliffe** from President to Chairman of the Board and **Joseph G. Slater** from Executive Vice-President and Treasurer to President, was announced by the **Triangle Conduit & Cable Company, Inc.** of New Brunswick, N. J. Mr. McAuliffe will continue as Chief Executive Officer.

★ ★ ★

Carl S. Menger moves from Vice President in Charge of Sales to Executive Vice-President and **Jack M. Slater** has been made Treasurer. The latter is also Assistant Vice-President in Charge of Industrial Relations and Assistant Secretary. Two new members were added to the Board of Directors: **Carl S. Menger** and **Clyde V. McKay.**

★ ★ ★

The Company, organized March

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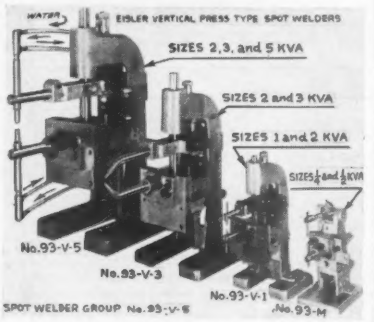

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To Manage L.O.F. Glass Fibers

John M. Keenan has been named general factories manager of **L.O.F. Glass Fibers Company,** it is announced by **Thomas A. Collins,** vice president and general manager of the firm's eastern division. He succeeds **J. H. Plummer,** who has resigned.

★ ★ ★

Mr. Keenan will have full supervision of all eastern division plants. Three are located in Defiance, Ohio, with Waterville, Ohio, and Parkersburg, W. Va. Mr. Keenan was formerly manager of the Parkersburg plant. He has been allied with the glass industry since 1950 when he joined Glass Fibers, Inc. as an industrial engineer.

R B & W Advances Two Sales Executives

Election of **W. Gould Jones** as vice president in charge of sales and a director of **Russell, Burdsall & Ward Bolt and Nut Company** has been announced by **William E. Ward,** president.

★ ★ ★

Harry O. McCully, whose position Mr. Jones assumes, has been elected senior vice president, and will continue actively in the formulation of sales policies. Mr. Mc-

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Ansonia Appoints West Coast Sales Manager

The appointment of **Tilden E. Thompson** as West Coast Regional Sales Supervisor for **The Ansonia Wire & Cable Company** has been announced by General Sales Manager **A. J. W. Novak.** In this new post, Mr. Thompson will manage sales efforts for the eight western states of Idaho, Nevada, Arizona, Utah, Washington, Oregon, California and Montana, where the company has distributors and sales representatives.

★ ★ ★

The appointment became effective May 1st, 1958. Mr. Thompson is making his headquarters in the vicinity of San Francisco.

Hoskins Elects Vice Presidents

The elevation of three men to vice presidential status has been announced by the **Hoskins Manufacturing Company**, 4445 Lawton Ave., Detroit 8, Mich.

★ ★ ★

These are **J. E. Purgoval,** who has been elected Vice President in Charge of Manufacturing; **J. M. Thomas,** who was made Vice President—New Product Planning and Development; and **R. I. Cratch,**

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who becomes Vice President—Marketing.

★ ★ ★

Hoskins is a leading manufacturer of resistance and other alloy wires.

Lamson & Sessions Appointments

J. Wallace Nall has been made General Manager of Lamson & Sessions' Chicago plant. He was formerly Sales Manager.

★ ★ ★

Other promotions announced were **J. M. Rowe** to General Manager, Birmingham plant; **William B. Manning** to Sales Manager, Southeastern Division; and **Felder Wright** to Sales Manager, Southwestern Division.

Eastern Representative Appointed by Risdon

The Risdon Manufacturing Co., Naugatuck, Conn., Wire Goods Division announces the appointment of **Richard W. Russell,** 6 South Valley Rd., Paoli, Pa., as manufacturer's representative for Risdon wire form specialties and small metal stampings in Delaware, Southern New Jersey and Eastern Pennsylvania.

Light Metals and Alloys B-7

This compilation of ASTM specifications and methods of test for light metals and alloys has been prepared to make these standards available in convenient form, superseding the 1955 edition. It includes not only those specifications and methods of test which come under the jurisdiction of Committee B-7 on Light Metals and Alloys, but also those for light metal alloy die castings, prepared by Committee B-6 on Die Castings, and those for aluminum wire and cable for electrical purposes, sponsored by Committee B-1 on Wires for Electrical Conductors.

★ ★ ★

Several methods under the jurisdiction of Committee E-1 on Methods of Testing and Committee E-3 on Chemical Analysis of Metals have been added so that the compilation will be as useful as possible. Specifications for arc-welding electrodes and for brazing filler metal under the jurisdiction of the AWS-ASTM Joint Committee on Filler Metal have been included.

★ ★ ★

There are 51 standards of which 36 are new, revised or have had their status recently changed. Copies of this book may be obtained from ASTM Headquarters, 1916 Race St., Phila. 3, Pa. at $3.75 each.

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WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.
Only advertisers who have contracted for six or more insertions are listed in this section.

ABRASIVES—
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Norton Co., Worcester, Mass.

ACID INHIBITORS—
(See Inhibitors, Pickling)

ADJUSTABLE SPEED DRIVES—
The Louis Allis Company, Milwaukee, Wisc.

ANNEALING MACHINES — Electric Resistance
Syncro Machine Co., Perth Amboy, N. J.

ANNEALING POTS AND BOXES—
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.

BAKERS—
(See OVENS—Rod Bakers)

BOBBINS—Braider & Wire Weaving
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Molded Fibre Glass Tray Co., Linesville, Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
National Vulcanized Fibre Co., Lestershire Spool Div., Johnson City, N. Y.
Standard Mill Supply Co., Pawtucket, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

BORAX—Wire Drawing
United States Borax & Chemical Corp., Pacific Coast Borax Co. Div., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CABLE FILLERS—Paper
Twitchell, Inc., E. W., Philadelphia, Pa.

CAPSTANS—for Wire (also Caterpillar Types)
Burlington Fabricators, Inc., Products Div., Burlington, N. J.
Colbourne Machine Company, Winsted, Conn.
Davis Electric Co., Wallingford, Conn.
Entwistle, James L., Esmond, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Kraft, J. A. Maschinenfabrik, OLPE/Westf., Germany
Larmuth & Bulmer Limited, Manchester, England
Litzler, C. A. Co., Inc., Cleveland, Ohio

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro. Mass.
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

CASTINGS—Wire Mill
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Magnuson Products Corporation, Brooklyn, N.Y.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Parkin Chemical Co., The, Pittsburgh, Pa.
Rome Soap Manufacturing Co., Rome, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.

CLEANING & PICKLING EQUIP.—
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, Ohio
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

CLOTH—WIRE, All Metals
Wickwire Bros., Cortland, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corporation, Brooklyn, N.Y.
Miller, R. H., Co., Homer, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.
United States Borax & Chemical Corp., Div. Pacific Coast Borax Co., New York, N. Y.

COLOR CONCENTRATES— For Wire Coatings
Blane Corporation, The, Canton, Mass.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.

COMPOUNDS—Diamond (Pre-Mixed)
Eastern Carbide Corp., New Rochelle, N. Y.
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago
Rusch Wire Die Corporation, Croton-on-Hudson, N. Y.

COMPOUNDS—Extrusion, for Wire
Blane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation, New York, N. Y.

COMPOUNDS—For Improving Drawing & Extrusion
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Phosphate Coating
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corporation, Lawrence, Mass.
Apex Alkali Products Co., Philadelphia, Pa.
Rome Soap Manufacturing Co., Rome, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corporation, Brooklyn, N.Y.
Nopco Chemical Co., Harrison, N. J.
Standard Industrial Compounds Co., Frankfort, Ill.

COMPOUNDS—Vinyl
Blane Corporation, The, Canton, Mass.
Chemical Products Corporation, East Providence, R. I.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corporation, Brooklyn, N.Y.
Miller, R. H. Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Rome Soap Manufacturing Co., Rome, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.
Swift & Company, Chicago, Ill.
United States Borax & Chemical Corp., Pacific Coast Borax Co. Div., New York, N. Y.

CONDUCTORS—Flexible, Electrical
Montgomery Co., The, Windsor Locks, Conn.

CONTAINERS—Wire Packaging
(See DRUMS—Wire Packaging)

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Wire & Textile Mach'y, Inc. (used) Pawtucket. R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

COUNTERS—
(See MACHINERY—Measuring Wire and Cable)

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit

CUTTING TOOLS—Wire
Porter, H. K., Inc., Somerville, Mass.
Robinson, M. W. Co., Rockfall, Conn.

DIAMONDS—Industrial
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Danforth, The C. W. Co., Youngstown, Ohio
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Research Company, St. Clair Shores, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Hillside, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING—
Danforth, The C. W. Co., Youngstown, Ohio
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Research Co., St. Clair Shores, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIAMOND TOOLS—
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Universal Wire Die Co., Hillside, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide, Tungsten & Tantalum
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Metallurgical Products Dept. of General Electric Co., Detroit
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Hillside, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Cold Heading
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit

DIES—Diamond
Ajax Industrial Supplies, Inc., Ft. Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Brenon, Inc., Nixon, N. J.
Ft. Wayne Wire Die Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Wire Die Co., Inc., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Hillside, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES DIAMOND—Drawing Angle Controlled
Hoosier Wire Die, Inc., Ft. Wayne, Ind.

DIES DIAMOND—Reversible
National Wire Die Co., Inc., New York, N. Y.

DIES—Extrusion
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Kelloy Corporation, New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Hillside, N. J.
Wayne Wire Die Co., Hillside, N. J.
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Polishing, Asbestos Wire
Beard Machine Co., York, Pa.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Brenon, Inc., Nixon, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Metallurgical Products Dept. of General Electric Co., Detroit
National Wire Die Co., Inc., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Hillside, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.

DIES—Swaging
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Hoosier Wire Die., Inc., Ft. Wayne, Ind.
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Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
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Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRIVES—Electric, Adjustable Speed
Allis, The Louis Co., Milwaukee, Wisc.

DRUMS—Wire Packaging
Continental Can Company, Van Wert, Ohio
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.

DRUMS & TRAVERSES—For Cable Reels
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio

DRYING EQUIPMENT—
Carl Mayer Corp., The, Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FREQUENCY CHANGERS—
The Louis Allis Company, Milwaukee, Wisc.

FURNACES—Brazing
Ajax Electric Company, Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Sunbeam Corporation, (Industrial Furnace Division), Chicago, Ill.

FURNACES—Galvanizing Equipment
Electric Furnace Co., Salem, Ohio
Sunbeam Corporation, (Industrial Furnace Division), Chicago, Ill.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Company, Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Sunbeam Corporation, (Industrial Furnace Division), Chicago, Ill.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Company, Philadelphia, Pa.
Sunbeam Corporation, (Industrial Furnace Division), Chicago, Ill.

FURNACES—Resistance Heating, Strand
Electric Furnace Company, Salem, Ohio
Sunbeam Corporation, (Industrial Furnace Division), Chicago, Ill.

FURNACES—Salt Bath
Ajax Electric Company, Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio

FURNACES—Strand Annealing
Ajax Electric Company, Philadelphia, Pa.
Electric Furnace Company, Salem, Ohio
Sunbeam Corporation, (Industrial Furnace Division), Chicago, Ill.

GALVANIZING EQUIPMENT—(See MACHINERY—Galvanizing Wire)

GEARMOTORS—
The Louis Allis Company, Milwaukee, Wisc.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

GUIDES—For Wire
Burlington Fabricators Inc., Products Div., Burlington, N. J.
Heany Industrial Ceramic Corp., New Haven, Conn.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INKS—Printing, for Insulated Wire
Chemical Products Corporation, East Providence, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.

INSULATING MATERIALS —
Blane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
duPont de Nemours Co., (Inc.), E. I., Polychemical Dept., Wilmington, Delaware
General Electric Company, Insulating Materials Section, Schenectady, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Shawinigan Resins Corporation, Springfield, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation, New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, New York, N. Y.

LACQUERING SYSTEMS—See MACH.—Lacquering Electric Wire

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The, Philadelphia and Bellefonte, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corporation, Brooklyn, N.Y.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Company, Harrison, N. J.
Rome Soap Mfg. Co., Rome, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.

MACHINERY—Bobbin Winders
Hanson & Edwards, Ltd., Warrington, England
Larmuth and Bulmer, Limited, Manchester, England

MACHINERY—Bolt, Rivet, Screw, etc.
Behr Machinery & Equipment Corp., Rockford, Ill.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Braiding
New England Butt Co., Providence, R. I., Division of Wanskuck Co.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Haskell-Dawes Machine Co., Philadelphia, Pa.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Capstans and Machinery—Winding Wire)

MACHINERY—Centerless Grinding & Polishing
American Laubscher Corporation, New York, N. Y.

MACHINERY—Chain Link Fence
Norton & Co., Ltd., Sir James Farmer, Manchester, England

MACHINERY—Chain Making
Baird Machine Company, Stratford, Conn.
Larmuth and Bulmer, Limited, Manchester, England
Nilson, A. H. Machine Co., Shelton, Conn.
Pan American Supply Co., The, New York, N. Y.

MACHINERY—Closing Rope
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth and Bulmer, Limited, Manchester, England
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Cold Heading
Behr Machinery & Equipment Corp., Rockford, Ill.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Herborn, Maschinenfabrik, Herborn, Germany
Morgardshammars Mek Verkstads A. B., Morgardshammar, Sweden.
National Mach'y Exch (Used), New York
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Cutting
Eisler Engineering Company, Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Pan American Supply Co., The, New York, N. Y.
Patterson Machine, Geo. C., Co., Cleveland, Ohio

MACHINERY—Dead Block (Stationary Coiler)
Morgan Construction Company, Worcester, Mass.
Wells Company, Frank L., Kenosha, Wisc.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Maschinenfabrik, Herborn, Germany
Wheelabrator Corporation, Mishawaka, Indiana

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
Metallurgical Products Dept. of General Electric Co., Detroit
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Co., Wallingford, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

MACHINERY—Extruding
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

WHERE TO BUY, Continued

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Norton & Co., Ltd., Sir James Farmer, Manchester, England

MACHINERY—Flat Wire
Mettler Machine Tool, Inc., New Haven, Conn.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming Wire
Baird Machine Company, Stratford, Conn.
Nilson, A. H. Machine Co., Shelton, Conn.

MACHINERY—Galvanizing Wire
Vaughn Machinery Co., Cuyahoga Falls, O.
Whitacre Engineering & Manufacturing Company, Alhambra, California
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Mfg. Co., Wallingford, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Hydraulic
Porter, Inc., H. K., Somerville, Mass.

MACHINERY—Insulating Wire
American Insulating Mach'y Co., Phila., Pa.
Beard Machine Co., York, Pa.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia
Cook Mfg. Co., The, Paterson, N. J.
Michigan Oven Company, Detroit, Mich.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg Co., Milwaukee, Wis.
Entwistle, James L., Esmond, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.

MACHINERY—Packaging Wire
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Godderidge Ste., Houilles (Seine-et-Oise), France
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Patenting Wire
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Plating
Hodge Bros. Machine Shop, Ossining, N. Y.
Universal Industrial Equipment Co., Secaucus, N. J.

MACHINERY—Pointing
Herborn, Maschinenfabrik, Herborn, Germany
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York,
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Polishing Asbestos Wire
Beard Machine Co., York, Pa.

MACHINERY—Printing on Electric Wire
Entwistle, James L., Esmond, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M. Co., Inc., Boylston, Mass.

MACHINERY—Re-Spooling
Burlington Fabricators, Inc., Products Div., Burlington, N. J.
Colbourne Machine Company, Winsted, Conn.
Emory Company, Robert J., Newark, N. J.
Entwistle, James L., Esmond, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Herborn, Maschinenfabrik, Herborn, Germany
Hodge Bros. Machine Shop, Ossining, N. Y.
Industrial Winding Machinery Co., New York, N. Y.
National Mach'y Exch. (Used), New York N. Y.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

MACHINERY—Rod Mill
Herborn, Maschinenfabrik, Herborn, Germany
Morgan Construction Co., Worcester, Mass.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Royle, John & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Serving
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Spark Testing
Davis Electric Co., Wallingford, Conn.
Entwistle, James L., Esmond, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Peschel Electronics, Inc., New Rochelle, N. Y.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Pan American Supply Co., The, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Staple
Baird Machine Company, Stratford, Conn.
Nilson, A. H. Machine Co., Shelton, Conn.
Pan American Supply Co., The, New York, N. Y.

MACHINERY—Straightening & Cutting
American Laubscher Corporation, New York 19, N. Y.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Pan American Supply Co., The, New York, N. Y.
Patterson Machine, Geo. C., Co., Cleveland, Ohio
Porter, Inc., H. K., Somerville, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Stranding
Godderidge Ste., Houilles, (Seine-et-Oise), France
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth & Bulmer Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
American Insulating Mach'y Co., Phila., Pa.
Burlington Fabricators, Inc., Products Div., Burlington, N. J.
Colbourne Machine Company, Winsted, Conn.
Collins Bros. Machine Co., Wire & Cable Machy. Div., Pawtucket, R. I.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Entwistle, James L., Esmond, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Kraft, J. A., Maschinenfabrik, OLPE/Westf. Germany
Larmuth & Bulmer Limited, Manchester, England
Litzler, C. A., Co., Inc., Cleveland, Ohio
Pourtier Pere et Fils, Romainville (Seine) France
Standard Mill Supply Co., Pawtucket, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Collins Bros. Machine Co., Wire & Cable Machy. Div., Pawtucket, R. I.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing Magnet Wire Coatings for Pin Holes
Federal Mfg. Co., Wallingford, Conn.
Peschel Electronics, Inc., New Rochelle, N. Y.

MACHINERY—Testing, Physical
Scott Testers, Inc., Providence, R. I.

MACHINERY—Thread Rolling
Mettler Machine Tool, Inc., New Haven, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Godderidge Ste., Houilles (Seine-et-Oise), France
Syncro Machine Co., Perth Amboy, N. J.
Universal Industrial Equipment Co., Secaucus, N. J.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—Welded Wire Mesh
National Electric Welding Machines Co., Bay City, Michigan

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot and Machinery —Welding Wire Fabrics)

MACHINERY—Winding Wire
Burlington Fabricators, Inc., Products Div., Burlington, N. J.
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Entwistle, James L., Esmond, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Industrial Winding Machinery Co., New York, N. Y.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Laubscher Corporation, New York 19, N. Y.
Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Federal Mfg. Co., Wallingford, Conn.
Herborn, Maschinenfabrik, Herborn, Germany
Hodge Bros. Machine Shop, Ossining, N. Y.
Morgan Construction Co., Worcester, Mass.
Morgardshammars Mek Verkstads AB, Morgardshammar, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Norton & Co., Ltd., Sir James Farmer, Manchester, England

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Pan American Supply Co., The, New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wartenweiler, Emilio, Milan, Italy
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Wire Forming
Baird Machine Company, Stratford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Nilson, A. H. Machine Co., Shelton, Conn.
Pan American Supply Co., The, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
Larmuth (1947) Ltd., Swinton, England

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MOTORS—Electric, A.C. — D.C.
The Louis Allis Company, Milwaukee, Wisc.

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
Wickwire Brothers, Inc., Cortland, N. Y.

NIPPERS—Wire Cutting
Robinson, M. W. Co., Rockfall, Conn.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila., Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Colbourne Machine Company, Winsted, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

OVENS—Rod Bakers
Carl Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl Mayer Corp., The, Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio

PAILS—Packaging
(See Drums—Wire Packaging)

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAPER—Creped Wrapping
Ludlow Papers, Inc., Needham Heights, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Ludlow Papers, Inc., Needham Heights, Mass.

PAPER—Insulating
Ludlow Papers, Inc., Needham Heights, Mass.
Twitchell, Inc., E. W., Philadelphia, Pa.

PATENT—ATTORNEYS—
Rommel, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PLASTICIZERS—
Monsanto Chemical Company, Plastics Division, St. Louis, Mo.

PLASTICS—for Wire Insulation
Blane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
duPont de Nemours Co., (Inc.), E. I., Polychemical Dept., Wilmington, Delaware
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Shawinigan Resins Corporation, Springfield, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation, New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, New York, N. Y.

PRINTING WHEELS—for Electric Wire
Entwistle Manufacturing Corporation, Providence, R. I.
Gillies, Duncan M. Co., Inc. Boylston, Mass.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

RACKS—Wire Storage
Burlington Fabricators, Inc., Products Div., Burlington, N. J.
Jarke Manufacturing Co., Chicago, Illinois

REEL AND TENSION STANDS—
Burlington Fabricators, Inc., Products Div., Burlington, N. J.
Mettler Machine Tool, Inc., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
National Vulcanized Fibre Co., Lestershire Spool Div., Johnson City, N. Y.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio

REELS—Metal Bound
Durkee Mfg. Co., Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
National Vulcanized Fibre Co., Lestershire Spool Div., Johnson City, N. Y.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS—Plywood
Carris Reels, Inc., Rutland, Vt.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Evans, George, Corp., Moline, Ill.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
National Vulcanized Fibre Co., Lestershire Spool Div., Johnson City, N. Y.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Steel, for Rope and Cable
Evans, George, Corp., Moline, Ill.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Boonton Molding Company, Boonton, N. J.
Bridge Mfg. Co., The, Hazardville, Conn.
Burlington Fabricators, Inc., Products Div., Burlington, N. J.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Molded Fibre Glass Tray Co., Linesville, Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
National Vulcanized Fibre Co., Lestershire Spool Div., Johnson City, N. Y.
Nilson, A. H. Machine Co., Shelton, Conn.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wood
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

RODS—Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Niederrheinische Huette, A. G., Duisburg, Germany
Pittsburgh Steel Co., Pittsburgh, Pa.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

SATURATION SYSTEMS—
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—Plastic
Boonton Molding Company, Boonton, N. J.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Molded Fibre Glass Tray Co., Linesville, Pa.
National Vulcanized Fibre Co., Lestershire Spool Div., Johnson City, N. Y.
Standard Mill Supply, Co., Pawtucket, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

STOCK STORAGE SYSTEMS
Jarke Manufacturing Co., Chicago, Illinois

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

TABLES—Press Feeding
Jarke Manufacturing Co., Chicago, Illinois

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TESTERS—INSULATION
(See MACHINERY—Spark Testers)

TESTING EQUIPMENT
(See MACHINERY Testing, Physical and Diameter Testing)

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TOOLS—Wire Cutting
Porter, H. K., Inc., Somerville, Mass.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Adjustable Speed Drives)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Hodge Bros. Machine Shop, Ossining, N. Y.
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

VARNISHES & LACQUERS—for Electric Wire
General Electric Company, Insulating Materials Section, Schenectady, N. Y.
Shawinigan Resins Corporation, Springfield, Mass.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila, Pa.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

WELDERS—Spot and Butt and Welding Wire Fabrics
Eisler Engineering Corp., Newark, N. J.
Micro Products Co., Chicago, Ill.
National Electric Welding Machines Co., Bay City, Michigan

WHEELS—for Printing on Electric Wire
Gem Gravure Company, West Hanover, Mass.

WIRE—Aluminum
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Ball
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Barbed
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

WIRE—Brass and Bronze
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Cadmium
Stamford Processing Co., Peekskill, N. Y.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Clad and Plated
Sylvania Electric Products Inc., Warren, Pennsylvania

WIRE—Cold Heading
American Chain & Cable, Page Steel and Wire Division, Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Sylvania Electric Products Inc., Warren, Pennsylvania
United Wire & Supply Corporation, Providence, R. I.

WIRE—For Electrical Conductors
United Wire & Supply Corporation, Providence, R. I.

WIRE—Flat
American Chain & Cable, Page Steel and Wire Division, Monessen, Pa.
Montgomery Co., The, Windsor Locks, Conn.
National Standard Company, Niles, Mich.
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Sylvania Electric Products Inc., Warren, Pennsylvania
United Wire & Supply Corporation, Providence, R. I.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Galvanized
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
National Standard Company, Niles, Mich.
Roebling's, John A. Sons Corp., Trenton, N. J.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—High Carbon
American Chain & Cable, Page Steel and Wire Division, Monessen, Pa.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Manufacturers
American Chain & Cable, Page Steel and Wire Division, Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark N. J.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Corporation, Pressed Steel Div., Cleveland, Ohio
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
Sylvania Electric Products Inc., Warren, Pennsylvania
United Wire & Supply Corporation, Providence, R. I.
U. S. Steel Corp., N. Y., N. Y.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Metalizing
American Chain & Cable, Page Steel and Wire Division, Monessen, Pa.
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WIRE—Music
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Worcester Wire Works Div., National-Standard Company, Worcester, Mass.

WIRE—Needle
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Alloy
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Malin & Co., The, Cleveland, Ohio
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Oil Tempered
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Special Shapes
American Chain & Cable, Page Steel and Wire Division, Monessen, Pa.
Continental Steel Corp., Kokomo, Ind.
National Lock Washer Company, The, Newark, N. J.
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Sylvania Electric Products Inc., Warren, Pennsylvania
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Spring
American Chain & Cable, Page Steel and Wire Division, Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Roebling's John A., Sons Corp., Trenton, N. J.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
United Wire & Supply Corporation, Providence, R. I.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Chain & Cable, Page Steel and Wire Division, Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Firth Sterling, Inc., Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Steel—Also Coppered and Galvanized Steel
American Chain & Cable, Page Steel and Wire Division, Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting
American Chain & Cable, Page Steel and Wire Division, Monessen, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WOOD—for Guide, Rolls, Bushings, Wear Parts, etc.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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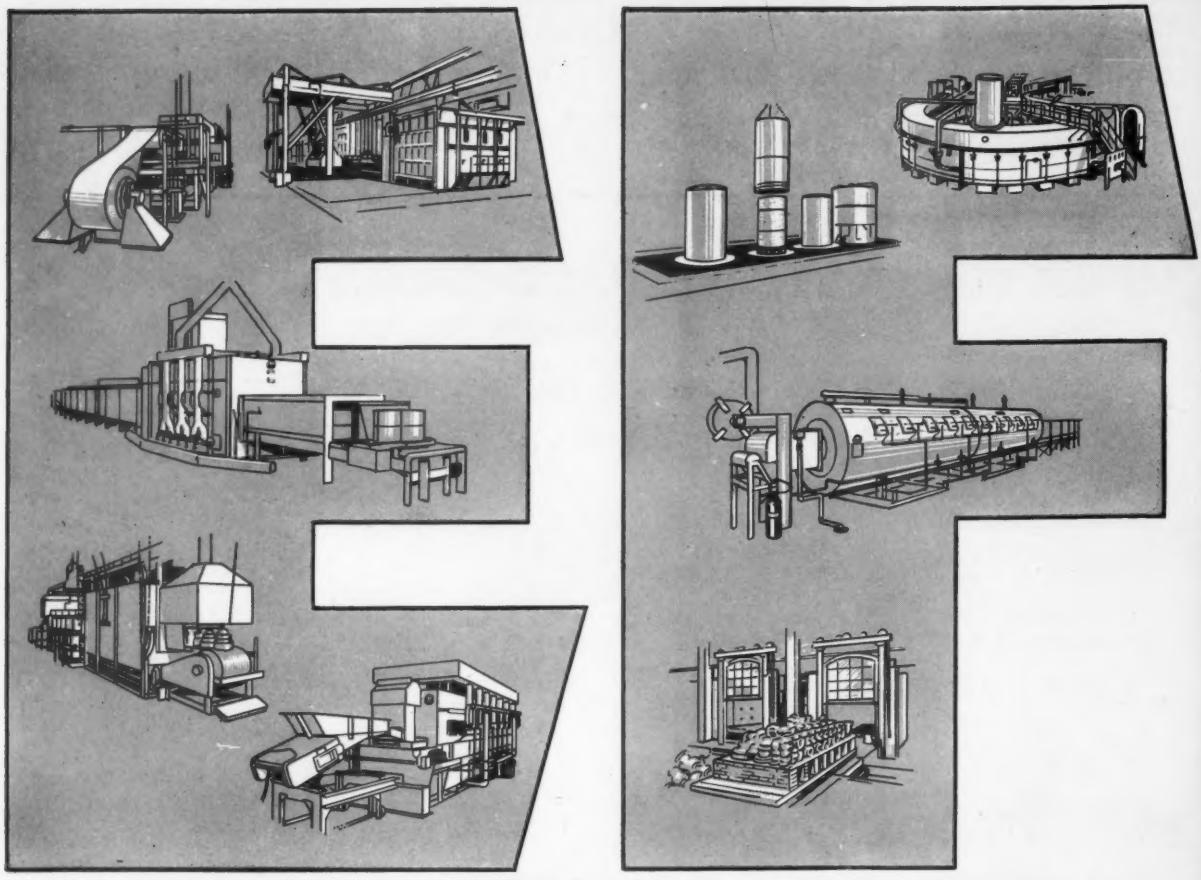

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